TWO-STAGE LOW NOISE ADVANCED TECHNOLOGY FAN

I. AERODYNAMIC, STRUCTURAL, AND ACOUSTIC DESIGN

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by

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16. Abstract

A two-stage fan was designed to reduce noise as much as 20 dB below current requirements. The first-stage rotor has a design tip speed of 365.8 m/sec (1200 ft/sec) and a hub/tip ratio of 0.4. The fan was designed to deliver a pressure ratio of 1.9 with an adiabatic efficiency of 85.3 percent at a specific inlet corrected flow of 209.2 kg/sec/m^2 (42.85 lbm/sec/ft^2). Noise reduction devices include acoustically treated casing walls, a flowpath exit acoustic splitter, a translating centerbody sonic inlet device, widely spaced blade rows, and the proper ratio of blades and vanes. Other features include multiple-circular-arc rotor airfoils, resettable stators, split outer casings, and capability to go to close blade-row spacing.

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TWO-STAGE, LOW NOISE ADVANCED TECHNOLOGY FAN
I. AERODYNAMIC, STRUCTURAL, AND ACOUSTIC DESIGN

H. E. Messenger, J. T. Ruschak and T. G. Sofrin

SUMMARY

Advanced, long-range, commercial transport aircraft will require a major reduction in engine noise without compromising requirements for high efficiency and adequate stall margin. To achieve a reduction of noise 20 dB below current requirements and to attain efficiency levels, stall margin, flow, and pressure ratio typical of an advanced fan, a two-stage, low tip-speed fan was selected as optimum for the flight Mach number range of 0.85 to 0.90.

Design features to reduce noise include use of low tip speeds and moderate blade aerodynamic loadings, proper relationship of the number of blades and vanes, axial spacings between blade rows of two aerodynamic chord lengths, acoustically treated casing walls, a flowpath exit acoustic splitter, and a translating centerbody sonic-inlet device.

The aerodynamic design was governed by the approximate parameters specified in the contract and applicable test data. Successful NASA-sponsored research fans tested by P&WA™ were used to establish criteria for good efficiency and stall margin. Important fan design parameters include a pressure ratio of 1.90 with a fan adiabatic efficiency of 85.3 percent, a first-stage rotor tip speed of 365.8 m/sec (1200 ft/sec), and a specific flow at the first-stage rotor inlet of 209 kg/sec/m^2 (42.85 lbm/sec/ft^2). Other features of the design include a fan flowpath with a constant outer diameter of 0.836 m (32.90 in.), constant diameter hub sections between blades and vanes to facilitate use of axial spacers for alternate test configurations, multiple-circular-arc rotor airfoils, stators with resettable stagger angle capability, and split outer casings to accommodate on-stand configuration changes.

Structural and vibration analyses included calculation of blade-disk frequencies and their resonances with rig excitations, blade and vane steady-state stresses and flutter parameters, rig critical speeds, and rotor forced response to unbalance. Predicted stresses due to centrifugal, gas bending, and untwist forces are well within the capabilities of the materials selected. To avoid resonances and flutter, first-stage and second-stage rotor blades have a partspan shroud at 66.5 and 60 percent span from the hub, respectively. All blades and vanes were predicted to be free of flutter.

INTRODUCTION

A fan research program is being conducted by P&WA for NASA-Lewis Research Center under Contract NAS3-16811. The objective of the program is to develop fan technology for application in turbofan engines for an advanced, long-range commercial transport with a cruise Mach number of 0.85 to 0.9. These future engines will be required to meet stringent noise reduction goals with minimum performance penalties. To achieve these goals, fans included in such engines must, during their design phase, incorporate features both to minimize the generation of noise and to obtain the maximum suppression of the noise generated.

An earlier NASA-Lewis study had been conducted for Advanced -Technology-Transport (ATT) application to determine the optimum fan configuration and performance parameters for a cruise Mach number of 0.85 to 0.9 and the stringent noise reduction goal of 20 dB below current requirements (FAR 36). The study showed that the optimum configuration was a low tip-speed, two-stage fan with a low hub/tip ratio [ref. 1]. The optimum pressure ratio was 1.9 and the tip speed was 365.8 m/sec (1200 ft/sec). Under current program, Contract NAS3-16811, this optimum fan is to be designed, constructed, and tested.

Several features that have the potential for minimizing noise were incorporated in this two-stage fan. These features include substantial axial spacing between blades and vanes, proper relationship of the number of blades and vanes, extensive use of acoustic treatment in casing walls and in a flowpath exit acoustic splitter, and a sonic inlet device using a translating centerbody.

Aerodynamic conditions for the fan are within the range of data obtained on two earlier, successful NASA-Lewis sponsored research fans tested by P&WA: 1) a 304.8 m/sec (1000 ft/sec) tip-speed, low-noise, single-stage fan [ref. 2] and 2) a two-stage, 442.0 m/sec (1450 ft/sec) tip-speed fan [ref. 3]. The information obtained from these two previous programs provide a solid foundation for performance predictions and for selection of blade and vane sections for the current design.

This report presents details of the aerodynamic, structural, and acoustic design of the current two-stage fan. Special terms, abbreviations, and symbols used in this report are defined in Appendix A.

AERODYNAMIC-ACOUSTIC CONSIDERATIONS

Both general design parameters and detailed elements of the fan design were significantly affected by the need to incorporate low noise features. A low tip-speed of 365.8 m/sec (1200 ft/sec) and moderate blade loadings were selected for low noise. As a result, two stages were required to obtain the design pressure ratio. A rather high fan-flow/unit-annulus-area of 209.2 kg/sec/m^2 (42.85 lbm/sec/ft^2) was chosen consistent with low engine frontal area and minimum diffusion from sonic inlet throat to fan inlet. The numbers of blades and vanes were chosen to restrict propagation of interaction tone noise at blade-passing frequency and yet maintain the desired solidities. These aerodynamic-acoustic considerations imposed a blade number relationship of s = 2r + 6, where s is the number of stator vanes in a given stage and r the number of upstream rotor blades. To reduce blade-passing tone noise, axial spacings between blade and vane rows were set such that at all spanwise positions the leading edge of each blade row is a minimum of two aerodynamic chords downstream of the trailing edge of the upstream blade. Constant diameter casing wall sections are provided between blade rows to permit tests with alternate spacings and to facilitate incorporation of wall acoustic treatments. Fan exit ducting was designed to include a removable acoustically treated flow splitter as well as wall treatments. A two-ring, acoustic inlet was initially selected to aid in suppression of forward radiated noise; however, this effort was discontinued in favor of a translating centerbody sonic inlet device. Acoustic treatments were also included in the inlet casing walls.

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FLOWPATH AND VELOCITY VECTOR DIAGRAM DESIGN

General aerodynamic design parameters (Table I) for the two-stage low noise fan were chosen to conform with contract requirements, to provide similarity with advanced-technology NASA fan-stages of proven high performance, and to permit the use of existing hardware and test facilities. Because this fan is for application in an engine with a rather high bypass ratio, representative aerodynamic and acoustic data can be obtained without splitting the duct and core flow at the fan exit.

TABLE I

GENERAL AERODYNAMIC DESIGN PARAMETERS

	CONTRACT WORK STATEMENT	DESIGN
Overall Total Pressure Ratio	1.8-2.0	1.90
Overall Adiabatic Efficiency (%)	-	85.3
Parameters at Inlet to First Rotor:		
Tip Diameter - meters (inches)	0.762 (30) (min.)	0.836 (32.90)
Tip Speed - m/sec (ft/sec)	335.3-396.2 (1100-1300)	365.8 (1200)
Hub/Tip Ratio	0.4 (approx)	0.4
Specific Flow - kg/sec/m^2 (lbm/sec/ft^2)	-	209.2 (42.85)
Corrected Flow - kg/sec (lbm/sec)	-	96.39 (212.5)
Corrected Speed (rpm)	-	8367

DESIGN ITERATIONS

The flowpath and velocity vectors used to design the rotor and stator blade elements of the fan were determined from a series of iterations. The iterations were started using a reasonable flowpath shape and general design parameters consistent with requirements for a high bypass ratio turbofan engine, together with estimated efficiency profiles and flow blockages. Velocity vectors and flow conditions were then calculated by a computation system that provides an axisymmetric, compressible flow solution of continuity, energy, and radial equilibrium equations, with curvature, enthalpy, and entropy gradient terms included in the equilibrium equation [Appendix A of ref. 4]. To control velocities and loadings and to maximize predicted stall margin, a series of streamline analysis program runs was used to adjust flowpath shape, blade solidities, and spanwise total pressure slopes. Losses were reestimated using correlations of loss versus Mach number and loading for each significant

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aerodynamic change. Stall margin was estimated by using the flowfield calculation to predict blade loading increases as the fan is back-pressured and by using loading limits established from test data as criteria for stall. The final set of design velocity vectors, together with assumed solidities and numbers of blades, was then used in the design of rotor and stator blade elements. Stress and vibration analyses were performed concurrently with the aerodynamic design to insure that the aerodynamic design would be compatible with mechanical design criteria. In subsequent flowpath and velocity vector iterations, calculation stations were revised to conform to actual leading and trailing edge locations of each blade and vane row and to retain desired axial spacings between blade rows. Performance parameters at the design point are summarized in Table II.

TABLE II

DESIGN PERFORMANCE

| | PRESSURE RATIO | | ADIABATIC EFFICIENCY | |
	Local (per blade row)	Cumulative	Local (per blade row)	Cumulative
Blade Row				
Rotor 1	1.485	1.485	89.5%	89.5%
Stator 1	0.984	1.461		85.6%
Rotor 2	1.317	1.924	90.9%	87.3%
Stator 2	0.987	1.898		85.3%
Stage				
First	1.461		85.6%	
Second	1.298		86.1%	

LOSSES

Design values of rotor loss (Figure 1, lower set of curves) were estimated using a correlation of total loss versus inlet relative Mach number and loading based on fan rotor test data. No additional losses were added in the partspan shroud regions. Design stator losses (Figure 1, upper set of curves) were based on data correlated as loss parameter versus diffusion factor and percent span. A comparison of the final estimated values of rotor and stator design losses with data[†] from tests of the 304.8 m/sec (1000 ft/sec) single-stage [ref. 5] and the 442.0 m/sec (1450 ft/sec) two-stage [ref. 3] NASA fans is also shown in Figure 1. The corresponding spanwise profiles of rotor adiabatic efficiency are given in Figure 2.

FLOW BLOCKAGES

Flow blockages were included in the aerodynamic design to account for boundary layer growth on casing walls and to account for the presence of a partspan shroud on each rotor. Blockages due to casing boundary layers at the fan inlet were calculated from analytical predictions of displacement thicknesses. Wall boundary layer growth through the blade rows was estimated from test data from the 442.0 m/sec (1450 ft/sec) fan which achieved its design flow rate [ref. 3]. In addition, to account for the presence of the rotor partspan

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[†]   Unless otherwise indicated, all data shown in comparisons are for test points at design speed on an operating line passing through the design point of the referenced fan.

shrouds, a blockage equal to the percent of annulus area occupied by each shroud was applied at the exit of the rotors, and approximately one-fourth of this amount was used at the inlet of each rotor. In calculating the design velocity vectors and flow conditions, the total blockages listed in Table III were applied equally to all stream tubes at each of the indicated axial locations.

TABLE III

FLOW BLOCKAGES (% OF ANNULUS AREA)
AT BLADE EDGE AXIAL LOCATIONS

LOCATION	TOTAL BLOCKAGE
R1 L. E.	2.6
R1 T. E.	4.9
S1 L. E.	3.1
S1 T. E.	3.3
R2 L. E.	3.7
R2 T. E.	6.1
S2 L. E.	4.3
S2 T. E.	4.6

AIR ANGLES AND VELOCITIES

The fan was designed with a constant tip diameter to allow all the flowpath convergence to be taken at the root of the flowpath, which tends to minimize critical root-loadings and the large past-axial turnings inherent in a low speed, low hub/tip ratio fan rotor. As shown in spanwise profiles of flow angle (Figure 3), the first-stage rotor is designed to turn the flow approximately 30 degrees past axial at the root, about 10 degrees less than the rotor design value of the 304.8 m/sec (1000 ft/sec) fan [ref. 6].

Fan exit flow (aft fan-duct) is axial, as specified by contract, and the annulus area is set to provide an average exit Mach number of about 0.40, a practical value for effective noise treatment and for low losses from struts and ducting downstream of the fan. Flowpath convergence and curvature of the inner casing walls between the inlet spinner and fan exit were used to control velocity profiles and blade aerodynamic loadings (diffusion factors). Resulting profiles of meridional velocity and Mach number at leading and trailing edges of blade rows are shown in Figures 4 through 7.

FLOWPATH SPACINGS

Two flowpath configurations are shown in Figure 8. The lower configuration is the basic test configuration, and the upper configuration is an alternate configuration with more

closely spaced blade rows. To reduce noise associated with blade-vane wake interactions, the axial spacings between adjacent blade rows of the basic flowpath (wide blade-spacing, lower configuration) were set such that at all spanwise positions the leading edge of each blade row is a minimum of two aerodynamic chords downstream of the trailing edge of the upstream blade row. Constant radius hub sections were specified between blade rows to facilitate the use of spacers for increasing or decreasing axial lengths between blade rows for alternate test configurations. The alternate configuration, the upper configuration in Figure 8, has axial spacings between successive blade rows of 1, 1, and 2 aerodynamic chords and an overall length approximately 0.17 m (6.5 in.) less than that of the basic configuration. Streamline analysis calculations indicate that velocity vectors for the two configurations are substantially the same and, hence, no significant differences in aerodynamic performance are predicted.

A schematic showing the mechanical layout of the rig is presented in Figure 9.

LOADINGS

Spanwise profiles of design diffusion factors for the current fan are compared in Figures 10 and 11 with the diffusion factors that had been obtained from tests of the two previous research fans. The Figures show that the average loadings of the current fan are lower than those of the 304.8 m/sec (1000 ft/sec) single-stage fan [ref. 5] and the 442.0 m/sec (1450 ft/sec) two-stage fan [ref. 3] at test points where each was operating with a practical stall margin and high efficiency. Considerable effort was devoted to balancing the design loadings among blade rows to achieve maximum predicted stall margin. Parameters which were varied in these attempts include hub casing contours, average total pressure ratios and spanwise total pressure slopes of each rotor, and first-stage stator exit air angles. Stall margin was estimated by using the flowfield calculation to predict blade loading increases as the fan is back-pressured and using loading limits established from test data as criteria for surge. The fan stall margin obtained with this method, which in previous applications has given good agreement with test values, is about 18 percent. The predicted fan stall was set by the second-stage stator hub which reached diffusion factor levels of 0.65, considered the loading limit for stators.

The resulting higher loadings and design pressure ratios of the first-stage relative to second-stage, as shown in Figures 10, 11 and 12, reflect a provision for an anticipated, more rapid increase of second-stage blade loadings with an increase in fan back-pressure. Radial profiles of total pressure were sloped negatively (i.e., higher pressure near the hub than near the tip) to obtain high velocities on the hub wall to reduce critical loadings. Also, as part of the attempt to achieve a desirable loading balance, flow angles were set at 7.5 degrees at the exit of the first-stage stator (Figure 13).

The predicted loadings for the four blade-rows at the estimated stall point are presented in Table IV below.

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TABLE IV

PREDICTED BLADE AERODYNAMIC DIFFUSION FACTORS AT STALL

	HUB (5% Flow)	MEAN (50% Flow)	TIP (90% Flow)
Rotor 1	0.55	0.55	0.51
Stator 1	0.62	0.46	0.45
Rotor 2	0.61	0.47	0.42
Stator 2	0.65	0.47	0.50

Tabulations of aerodynamic parameters at rotor and stator leading and trailing edges are provided in Appendix B (Tables XVI to XIX).

EXIT DUCT AERODYNAMIC DESIGN

The exit ducting and acoustic splitter contours for the fan were selected: 1) to provide conical casing surfaces convenient for incorporation of acoustic treatment, 2) to control Mach numbers for low losses and low noise, and 3) to allow use of existing rig hardware. Blockages were included in the flowfield calculation in order to account for boundary layer growth along the four flow-surfaces of the exit duct, and annulus areas were gradually increased along the duct to compensate for boundary layer growth to hold a Mach number of about 0.4 throughout the duct at the design point. The boundary layer parameters were estimated from limited test-data on flow over a perforated plate which is qualitatively similar to the acoustic treatments of the present design. Annulus blockages were set somewhat higher than are probably required, which should provide ability to operate at lower than design back pressure without choking of the flow in aft portions of the duct. Exit duct blockage values are listed in Table V. Use of these parameters and of an existing inner support structure resulted in the nearly parallel sloped duct casing walls and splitter contours as shown in Figure 14.

TABLE V

FLOW BLOCKAGES ASSUMED FOR EXIT DUCT DESIGN (% OF ANNULUS AREA)

AXIAL LOCATION FROM ROTOR 1 ROOT L.E. REFERENCE PLANE		TOTAL BLOCKAGE
(Meter)	(inch)	(%)
1.0363	40.8	5.6
1.0668	42.0	6.0
1.3208	52.0	7.3
1.5748	62.0	8.9
1.8288	72.0	10.5
2.0930	82.4	12.2
2.3368	92.0	12.2

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Splitter geometry was determined from acoustic treatment dimensions, which set splitter thickness at 0.0157 m (0.62 in.), and from the previously discussed Mach number considerations. The splitter nose was designed as an ellipse with a ratio of semi-major to semi-minor axis of 2.5:1, and the splitter trailing edge was designed as a boattail with a 15-degree included angle. In order to reduce the splitter incidence angle, and hence to eliminate undersirable flow separations at the fan aerodynamic design point, the splitter nose was inclined at an angle of 3 degrees with respect to the rig centerline as compared to a 7-degree angle for the major portion of the splitter. The splitter is supported by two sets of five struts which are circumferentially aligned with five exit duct support struts (Figure 14). These struts are contoured as 400 series airfoils.

AIRFOIL DESIGN

ROTORS

Airfoil Series

Rotor blades for both stages of the fan were designed using multiple-circular-arc (MCA) airfoils generated on conical surfaces which approximate streamsurfaces of revolution. As shown in Figure 15, each MCA airfoil section is defined by specifying a value of total chord, front chord, total camber, front camber, maximum thickness and its chordwise location, and leading and trailing edge radii. Blades of this airfoil series have been used successfully in several applications, providing much useful test data for design of airfoils in the transonic and high subsonic Mach number regimes. Such data have been applied to the present design.

Partspan Shrouds

Both rotors have a partspan shroud to provide mechanical stability. These shrouds are located at 66.5 and 60 percent span from the hub of rotor 1 and rotor 2, respectively, with relative spanwise positions chosen such that the second-stage rotor shroud lies approximately in line with the expected wakes from the first-stage rotor shroud, thus minimizing total loss and other aerodynamic penalties normally associated with the shrouds.

Chords, Thicknesses, and Numbers of Blades

A summary of rotor blading parameters is given in Table VI. Chords, solidities, and numbers of blades were chosen to be consistent with acceptable aerodynamic loadings, moderate axial lengths, structural requirements, low noise, and previous experience. In particular, to restrict propagation of blade-vane interaction noise, the numbers of blades and vanes were selected according to the relation s = 2r + 6, where s is the number of stator vanes in a given stage and r the number of upstream rotor blades. The number of rotor 1 blades was determined according to the relation s = 2r + 6, where s is the number of stator vanes in a given stage and r the number of upstream rotor blades. The number of rotor 1 blades was determined flutter-free operation and by maximum solidity limits which were set by channel flow area requirements. The number of rotor 2 blades was selected to provide a 5:4 ratio for the number-of-rotor-2 blades to the the number-of-rotor-1 blades to give desirable fan noise characteristics (see the Acoustic Design Section).

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TABLE VI

ROTOR BLADING PARAMETERS

	R1	R2
Number of Airfoils	28	35
Airfoil Series	MCA	MCA
Aspect Ratio [1]	2.75	2.54
Aspect Ratio [2]	2.19	2.21
Taper Ratio [3]	1.232	1.028
Hub Chord - meter (inch)	0.0897 (3.530)	0.0859 (3.382)
Tip Chord - meter (inch)	0.1105 (4.350)	0.0883 (3.476)
Tip Solidity	1.18	1.18
Hub Solidity	2.28	2.14

(1)   Average length/axially projected hub chord
(2)   Average length/chord at tip
(3)   Tip chord/hub chord

Rotor maximum-thickness to chord ratios, t/c, (Figure 16) were selected to provide mechanical stability while maintaining minimum airflow blockage. The chordwise locations of maximum thickness for both rotors (Figure 17) were set to give the blades the minimum possible leading edge wedge angles without creating cusp-shapes in the front portion of the blades. Rotor total chords and front chords are shown in Figure 18.

Incidence and Deviation Angles

Rotor leading and trailing edge metal angles (Figure 19) were determined from application of incidence and deviation criteria to the design velocity vectors. For rotor airfoil sections whose inlet relative Mach number exceeded 1.0, incidence angles (i_{ssa}) were set at a location halfway between the leading edge and the point from which a Mach wave emanates that meets the leading edge of the following blade. A nominal design value of i_{ssa}, of 1.5 degrees was chosen to account for development of the suction surface boundary layer, blockage at the blade leading edge, and bow wave losses. Actual values of incidence for rotors of the subject design (Figure 20) varied between approximately 1.0 and 2.4 degrees, the variation resulting from a selection of geometry to fulfill channel area requirements and to provide smooth blades. For subsonic sections, incidences were chosen at the leading edge at values consistent with minimum loss data from previous tests and with smooth distributions of blade geometry.

Rotor deviation angles were calculated using P&WA's cascade method modified by correction factors based on applicable rotor test data. Figure 21 shows the predicted deviations and comparisons with deviation angles calculated using Carter's Rule.

Channel Areas

To provide sufficient fan flow capacity while allowing the rotors to operate near minimum loss, the minimum critical area ratio $(A/A^*)_{min.}$ in channels between adjacent blades for both rotors (Figure 22) was set at approximately 1.03 over most of the span. Desired channel areas were obtained by varying the chordwise distribution of airfoil camber. Near the location of each shroud, front camber was increased to provide higher values of $(A/A^*)_{min.}$. In calculating A^* through the blade channels, losses were distributed in the following manner: no loss was applied ahead of the assumed normal shock at the blade passage entrance, a normal shock loss was applied at the blade passage entrance, and the remaining loss was distributed linearly through the rest of the channel.

The resulting profiles of front camber angle and chord-camber parameter are shown in Figure 23. Distributions of flow area ratio through the blade channels of both rotors are shown in Figure 24 for several spanwise locations. The distinctive shape of the A/A^* distribution at the root of rotor 1 is typical of a rotor root with past-axial turning [ref. 6].

Rotor Geometry

Rotor geometry on design conical surfaces is summarized in Appendix C (Tables XX and XXII); for each airfoil section, two values of total and front camber are tabulated. Figure 25 gives a polar representation of a blade mean-camber-line and the two definitions used to calculate these values of camber. For manufacturing purposes, the airfoil sections were redefined on planes normal to the stacking line, a radial line through the center of gravity of the root conical section. Rotor blade coordinates for these redefined sections are tabulated in Appendix D (Tables XXIV and XXVI), and Figure 26 gives the airfoil coordinate definitions used in these tabulations.

STATORS

Airfoil Series

MCA airfoils were also used in design of the first-stage stator vanes since this series of airfoils offers greater control of channel area than more conventional airfoil series and the potential for lower stator losses at the rather high stator root inlet Mach numbers of the present design. The second-stage stators were designed as 65/CA vanes (circular arc meanline with 65 series thickness distribution) since these vanes will operate with inlet Mach numbers less than 0.65, a regime where 65/CA airfoils have low losses.

Chords and Thicknesses

A summary of stator blading parameters is given in Table VII. To restrict propagation of blade-vane interaction noise, the numbers of vanes were selected according to the relation

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s = 2r + 6 as discussed under Rotors. Stator chords and the locations of maximum thickness for both stators are shown in Figures 27 and 28. To provide low stator losses, maximum thickness-to-chord ratios were set at minimum values consistent with structural requirements. These thickness ratios (Figure 29) are somewhat higher than those for stators tested in previous NASA fans because of the higher aspect ratios of the present design. Any loss penalties should be small, however, since most of the thicker airfoils will operate with rather low inlet Mach numbers.

TABLE VII

STATOR BLADING PARAMETERS

	S1	S2
Number of Airfoils	62	76
Airfoil Series	MCA	65/CA
Aspect Ratio [1]	5.03	3.89
Aspect Ratio [2]	3.81	3.73
Taper Ratio [3]	1.099	0.9709
Hub Chord - meter (inch)	0.0513 (2.020)	0.0489 (1.930)
Tip Chord - meter (inch)	0.0564 (2.220)	0.0475 (1.8707)
Tip Solidity	1.33	1.38
Hub Solidity	2.50	2.46

(1)   Average length/axially projected hub chord
(2)   Average length/chord at tip
(3)   Tip-chord/hub chord

Incidence and Deviation Angles

Selection of design incidence angles and calculation of deviation angles for both stators (Figures 30 and 31) were based on P&WA's cascade system and minimum loss data from previous tests. The resulting metal angles are shown in Figure 32.

Channel Areas

Minimum values of channel area ratio $(A/A^*)_{min.}$ near the stator 1 hub were set a few percent above the A/A^* for the corresponding stator inlet Mach number (Figure 33) according to a correlation of capture-area/throat-area ratio at minimum loss as a function of stator inlet Mach number [ref. 7]. The outer half of the blade has a front camber selected to give nearly

double-circular-arc (DCA) airfoils for this low Mach number portion of the vane. The resulting profiles of front camber and chord-camber parameter are shown·in Figure 34, and the channel distributions of A/A* for stator 1 are given in Figure 35. Channel area ratio was not a critical parameter in the design of stator 2 airfoils since the inlet Mach numbers are sufficiently low (0.50 - 0.65) that choking problems should not be encountered with the vanes selected by means of the P&WA correlation of cascade data.

Stator Geometry

Stator geometry on design conical surfaces is summarized in Appendix C (Tables XXI and XXIII). For manufacturing purposes, the airfoil sections were defined on planes normal to a radial (stacking) line. The resulting blade coordinates are presented in Appendix D (Tables XXV and XXVII).

INLET AERODYNAMIC DESIGN

OBJECTIVES AND TECHNIQUES

The purpose of the inlet aerodynamic designs is to provide inlet configurations that meet the program acoustical requirements while providing a minimum length in order to approach practical requirements of aircraft installation. Two inlet configurations were chosen for the program: a baseline standard inlet cowling configuration and a translating plug, choked (sonic) inlet configuration. Contours of these two configurations are shown in Figure 36.

The principal reason a translating centerbody, sonic inlet was chosen is because it provides a means of controlling flow area to achieve throat Mach numbers that give the desired noise suppression for a range of fan operating conditions. Furthermore, this configuration requires a minimum inlet length without excessive boundary layer growth or separation. Originally a two-ring, acoustic inlet had been selected; however, that design was discarded when the sonic inlet configuration was decided upon. A summary of the limited work done on the two-ring inlet is provided in Appendix E.

An inlet fabricated previously for another program is to be used as the baseline standard inlet cowling. This inlet provides a one-dimensional throat Mach number of 0.68 and has an inlet-length to fan-tip-diameter ratio (L/D) of 1.03 and an overall contraction ratio ($A_{highlite}$/ A_{throat}) of 1.65 — "highlight" is defined as the farthest forward point on the inlet cowling (Figure 36). The aerodynamic contours of the sonic inlet were designed using a transonic axisymmetric flow analysis and a modified Reshotko-Tucker mass-momentum integral boundary layer solution. The inlet contours for both the baseline and sonic inlet configurations were selected to minimize the velocity overspeed along the surface downstream of the throat which should result in the best diffuser performance with the least distortion at the fan face.

It should be noted that the inlet flow for the aircraft approach condition used in the aerodynamic design of the sonic inlet was assumed to be 80 percent of design flow, which is believed to be the lowest practical flow for a sonic inlet design within present constraints.

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Any lower flow assumption would necessitate lengthening the inlet beyond practical mechanical and flight engine limits. The 80 percent design flow condition is theoretically possible with a variable, fan-duct nozzle, permitting fan operation at a higher speed (approximately 80 percent design speed) and a lower pressure ratio (1.19) at the desired thrust condition for aircraft approach.

The geometries of the fixed outer inlet cowling and the inner translating centerbody are shown in Figure 36 in the fully extended, intermediate, and fully retracted positions. These positions are specified as the approach position at 80 percent design flow, the takeoff position at 92.6 percent design flow, and the cruise position at 100 percent design flow. The one-dimensional throat Mach numbers associated with these positions are respectively 0.9, 0.9, and 0.71.

SONIC INLET GEOMETRY

Inlet Cowling and Centerbody

Since the fan aerodynamic design was essentially complete when the sonic inlet aerodynamic design was initiated, the inlet design had to be compromised to retain the fan root flow angle associated with the conventional spinner. This resulted in an overall inlet length of about 1.2 meters (47.5 inches) for an inlet-length to fan-tip-diameter ratio (L/D) approximately 1.45, which is somewhat larger than 1.0, the maximum ratio judged practical for a flight application. An L/D ratio of 1.0 would have been possible had it not been necessary to diffuse the inlet flow to a rather high area in order to retain the fan root platform contour.

A 0.0032 meter (0.25 inch) truncation, or step, was added at the trailing edge of the centerbody to improve boundary layer characteristics in the region where the centerbody meets the fan spinner (Figure 36). The maximum centerbody radius was set at 0.19 meter (7.39 inches) at the throat of the inlet. The minimum cowling radius was set at 0.37 meter (14.55 inches) at an axial station 1.02 meters (40.0 inches) upstream of the first-stage rotor hub leading edge (reference plane).

Sonic Inlet Lip Shape

Since the sonic inlet is to be tested at static conditions only, an attempt was made to reproduce, as nearly as possible, the accelerations on the inlet surface which would be encountered at aircraft approach flight conditions. This was done by generating a 2.5:1 elliptical shape from the throat to approximately the inlet highlite station and then blending this contour to a circular arc by making them tangent and continuing the circular arc to complete the inlet contour. The overall contraction ratio ($A_{highlite}/A_{throat}$) of this configuration is equal to 1.45.

INLET MACH NUMBER DISTRIBUTIONS, BOUNDARY LAYER CHARACTERISTICS, AND ESTIMATED PRESSURES RECOVERIES

The outer wall Mach number and the boundary layer shape factor distributions were calculated for the baseline standard inlet configuration, and the results are shown in Figure 37 for the 100 percent speed, cruise flight condition. The shape factors are well under the separation limit of 2.2 to 2.5.

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For the sonic inlet configuration, attempts were made to obtain a uniform Mach number profile at the inlet throat to meet acoustic criteria. As shown in Figure 38, the desired flat profile was achieved for the approach configuration at the throat, an axial distance of 1.016 meters (40 inches) upstream of the rotor 1 hub leading edge.

Mach number and shape factor distributions along the sonic inlet walls for the approach, cruise, and takeoff positions are shown in Figures 39 through 44. The Mach numbers along both inner and outer walls for the approach configuration (Figure 39) are quite similar, showing a peak Mach number of approximately 0.92 near the throat of the inlet, while peak Mach numbers for the cruise configuration (Figure 40) are 0.77 and 0.83 for the inner and outer walls, respectively. At takeoff (Figure 41), the inner wall Mach number reaches a peak of 0.98 near the inlet throat while the outer wall value is 0.81 at this location.

The shape factors for the wall boundary layers shown in Figure 42 for the cruise configuration indicate a stable boundary layer on the outer wall, but the inner wall boundary layer deteriorates rapidly as the flow approaches the centerbody truncation. This deterioration could lead to locally separated flow in this region — separation is indicated when shape factor reaches values of 2.2 to 2.5. This would, however, be followed by a reacceleration and re-attachment of the flow on the spinner surface. A similar deterioration of shape factor in the area of centerbody and plug shaft truncation for the approach configuration is indicated in Figure 43 and an improvement in the boundary layer can be noted as the constant area portion of the inlet duct is reached; additional improvement will occur as the flow accelerates around the spinner. The takeoff configuration shown in Figure 44 has shape factor distributions similar to the cruise condition with the inner wall approaching a critically high value (2.17) near the intersection of the centerbody spinner. As in the cruise condition, the flow is expected to reattach on the spinner if any local separation occurs.

Baseline and sonic inlet total pressure recoveries were estimated from the analytical boundary layer solution and are presented in Table VIII.

TABLE VIII

BASELINE AND SONIC INLET TOTAL PRESSURE RECOVERIES

INLET CONFIGURATION	FLOW CONDITION ($\%W\sqrt{\theta}/\delta$)	(Throat Mach No.)	TOTAL PRESSURE RECOVERY
Baseline, Cruise	100	0.68	0.993
Sonic, T/O	92.0	0.90	0.975
Sonic, Cruise	100	0.71	0.987
Sonic, Approach	80	0.70	0.970

STRUCTURAL AND VIBRATION ANALYSIS

Design of the fan blading included structural and vibration analyses to determine configurations that satisfy mechanical design requirements. The analyses included calculation of: blade-disk frequencies and their resonances with rig excitations, steady-state stresses, blade-vane flutter parameters, rig critical speeds, and full rotor system response due to imbalance at the rotor 1 location.

The material for rotor 1 blades is AMS 4973F (titanium alloy) and for rotor 2 blades is AMS 4928 (titanium alloy). The material for the stator vanes is AMS 5613 (stainless steel), and the material for the disks, hubs, spacers, and seals is AMS 5616 (stainless steel).

ROTORS

Blade and Disk Vibration

A partspan shroud is required for each rotor to avoid first bending resonances with first and second order rig-frequencies in the operating range. The airfoil geometry and shroud location were chosen to provide the best compromise between high speed margin with a 3E resonance (3E = 3 excitations per rotor revolution) and the speed at which a 4E resonance would occur. The shroud location selected for rotor 1 (i.e., 66.5 percent span from the hub) gives this rotor a predicted 5.6 percent 1st coupled mode (bending and torsion) 3E resonance frequency margin at 105 percent of design speed and positions the 1st coupled mode 4E resonance at 75 percent design speed (Figure 45). For rotor 1, no 2nd coupled mode or 3rd coupled mode critical resonances exist in the operating range.

During sonic inlet testing, the five support struts for the translating centerbody will create a 5E, 1st mode resonance on rotor 1 at 4800 rpm (Figure 45). This resonance is not considered a problem because the inlet struts are 0.254 meter (10 inches) forward of rotor 1 leading edge and the resonance occurs low in the speed range where the excitation energy is low.

The second-stage rotor, with a shroud location at 60 percent span from the hub, has a 1st coupled mode 3E resonance frequency margin of 5.4 percent and a 1st coupled mode 4E resonance at 72 percent design speed (Figure 46). For rotor 2, no 2nd coupled mode or 3rd coupled mode critical resonances exist in the operating range. The 5.6 and 5.4 percent margins on 1st coupled mode 3E resonance are adequate, based on previous test results that have shown good correlation with design predictions. Moreover, increasing these margins on 3E resonance would position the 1st coupled mode 4E resonance at higher speeds in the operating range. Due to these limiting 3E margins, the operational speed of the fan will be held to 105 percent corrected design speed during the test program.

Rotor blade tip chordwise bending modes are of great concern with the thin tip sections of modern fan blades. Excitations from inlet struts and stator vanes upstream and downstream of the rotor can interact with the natural frequency of these tip chordwise modes to produce high dynamic stresses. Figures 47 and 48 show that the tip chordwise bending mode resonances will not occur in the critical portion of the speed range (70 - 105 percent of design speed).

Rotor Blade Stresses

Stresses due to centrifugal forces, air loads, and untwist forces were calculated for 105 percent of design speed, and the results are shown in Table IX. The allowable stresses for the blade material based on 338.6°K (150°F) metal temperature for rotor 1 and 421.9°K (300°F)

metal temperature for rotor 2 are also shown in this table. The maximum combined stresses of 3.24×10^8 N/m^2 (47,000 lbf/in.^{2}) for rotor 1 and 2.03×10^8 N/m^2 (29,500 lbf/in.^{2}) for rotor 2 are comparable to stress levels present in experimental and production blades and are well below the allowable stresses.

Gas bending stresses with centrifugal restorations were calculated at 105 percent of design speed. Airfoil stresses were minimized for the combination of load and no load conditions. The selected axial and tangential tilt of 0.00107 meter (0.042 inch) results in a maximum stress of 4.1×10^7 N/m^2 (6,000 lbf/in.^{2}) for rotor 1 and 2.8×10^7 N/m^2 (4,000 lbf/in.^{2}) for rotor 2.

TABLE IX

SUMMARY OF ROTOR STEADY STRESSES

105% of Design Speed — N/m^2 x 10^{-7} (lbf/in.^{2} x 10^{-3})

	ROTOR 1	ROTOR 2
P/A	20.0 (29)	14.5 (21)
Centrifugal Untwist	8.3 (12)	3.1 (4.5)
Gas Bending	4.1 (6)	2.8 (4)
Combined	32.4 (47)	20.3 (29.5)
Allowable	60.7 (88)	53.1 (77)

Modified Goodman diagrams (Figures 49 and 50) indicate that at the maximum steady stress points the maximum allowable vibratory stresses for rotors 1 and 2 are 10.67×10^7 (15,500 lbf/in.^{2}) and 12.72 and 10^7 N/m^2 (18,500 lbf/in.^{2}), respectively. During testing, a vibratory stress limit of 6.89×10^7 N/m^2 (10,000 lbf/in.^{2}) will be imposed. Since no low order resonances are expected in the high speed operating range, the actual vibratory stress levels that will be encountered during testing should be less than the 6.89×10^7 N/m^2 (10,000 lbf/in.^{2}) limit set as part of the test procedures.

Rotor Blade Flutter

Flutter is a self-excited, self-sustaining vibration which occurs in either a torsional or bending mode or a combination of both. To prevent rotor blade flutter, a partspan shroud is required for each rotor of the two-stage fan. Values of flutter parameters for the shrouded blades were calculated at 105 percent of design speed, the operating speed considered most critical in regard to flutter, and these values were compared with correlated test data from previous programs. The calculated values of reduced-velocity parameters ($2\,V'_1/c\omega_b$) and torsional-twist-to-bending-deflection ratio ($\psi\,c/d$) for the 1st coupled mode flutter are summarized in Table X and lie within the range of P&WA experience where flutter problems have not been encountered. Values of reduced-velocity parameter ($2\,V'_1/\,c\,\omega_t$) for torsional flutter, calculated at 105 percent speed (0.95 for rotor 1 and 1.2 for rotor 2) are also well within the range where flutter has not been experienced. The torsional frequency, ω_t, is based on the entire blade.

TABLE X

ROTOR FIRST COUPLED MODE FLUTTER PARAMETERS

ROTOR	REDUCED VELOCITY PARAMETER $(2\,V'_1/c\,\omega_b)$	TORSIONAL TWIST/ BENDING DEFLECTION $(\psi\,c/d)$
1	2.75	0.16
2	3.05	0.14

Partspan Shrouds

The partspan shrouds were sized and positioned to satisfy aerodynamic and structural requirements, including the 3E margin requirement. Shroud design parameters and stresses are summarized in Table XI, and a sketch of the shrouds is shown in Figure 51. Bearing stresses for the shroud are 3.55×10^7 N/m^2 (5,150 lbf/in.^{2}) for rotor 1 and 3.45×10^7 N/m^2 (5,000 lbf/in.^{2}) for rotor 2, which are below values tested successfully on P&WA research rigs, e.g. 5.86×10^7 N/m^2 (8500 lbf/in.^{2}). The shrouds were designed to fit together sufficiently tight to provide adequate damping of vibrations without "shingling".

The Z* ratios, a measure of the relative stiffnesses of the shroud and adjacent airfoil as defined in Appendix A, are within the realm of successful experience.

TABLE XI

PARTSPAN SHROUD PARAMETERS
(105% Speed)

	ROTOR 1	ROTOR 2
Spanwise Location (% Span From Hub)	66.5	60.0
Contact Angle - deg.	55.0	70.0
Z* Ratio	1.30	1.49
Bearing Stress - N/m^2 x 10^{-7} (lbf/in.^{2})	3.55 (5,150)	3.45 (5,000)
Bending Stress - N/m^2 x 10^{-7} (lbf/in.^{2})	40.0 (58,000)	29.1 (42,246)
Thickness - meter (inch)	0.005 (0.20)	0.0046 (0.18)

Disk and Attachment Stresses

Conventional dovetail attachments were selected for the blades of both rotors. The calculated and allowable disk and attachment stresses for critical locations are listed in Table XII. All calculated values fall below the maximum allowed. In addition, the dynamic stress ratio (airfoil root stress divided by attachment stress) is above the minimum recommended value of 2.0, indicating that the attachment can withstand vibratory stresses greater than those the airfoil can tolerate.

TABLE XII

ROTOR DISK AND ATTACHMENT STRESSES
(105% Design Speed)

LOCATION	TYPE OF STRESS	CALCULATED STRESS/ALLOWABLE STRESS $N/m^2 \times 10^{-7}$ ($lbf/in.^2 \times 10^{-3}$)	
		ROTOR 1	ROTOR 2
Blade Attachment	Combined	27.6/53.1 (40/77)	17.2/59.3 (25/86)
	Bearing	26.2/59.3 (38/86)	20.0/66.2 (29/96)
Disk	Tangential (avg.)	26.2/66.2 (38/96)	42.7/58.6 (62/85)
	Radial (max.)	15.9/53.8 (23/78)	11.0/47.6 (16/69)
Front Seal	Hoop	22.1/96.5 (32/140)	37.1/95.2 (53.8/138)
	Bending	4.1/96.5 (6/140)	13.8/95.2 (20/138)
Rear Seal	Hoop	22.1/96.5 (32/140)	37.1/95.2 (53.8/138)
	Bending	8.3/96.5 (12/140)	10.3/95.2 (15/138)

STATORS

Stator Vibration

Stator frequencies were calculated from a coupled bending-torsion analysis which included a model with the following end conditions:

- bending motion - moment restraint at airfoil hub and tip

- torsional motion - free at tip and restraint at spindle/actuation-arm junction (includes torsional flexibility of actuator arm).

As shown in Figures 52 and 53, the first two bending and torsion modes for stators 1 and 2 will not be excited by blade-passing orders in the operating range. Adequate margin on the first bending mode 3E resonance exists throughout the operating range and, based on past experience, higher order excitations should not result in vibrational problems.

Stator Stresses

Stator vane bending stresses due to air loads were calculated at 105 percent design speed. The maximum bending stress for stator 1 was calculated as 3.03×10^8 N/m^2 (44,000 $lbf/in.^2$)

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and for stator 2 as 2.99 x 10^8 N/m^2 (53,500 lbf/in.^{2}), which are considerably lower than the allowable stresses of 58.6 x 10^7 N/m^2 (85,000 lbf/in.^{2}) and 52.4 x 10^7 N/m^2 (76,000 lbf/in.^{2}) for stators 1 and 2, respectively. Stress allowables are based on vane material properties which are a function of metal temperatures. Vane metal temperatures used to determine allowable stresses for stator 1 and stator 2 are 65.56°C (150°F) and 148.89°C (300°F), respectively. Since no critical resonances are predicted in the operating range, vibratory stress levels are expected to be low. A maximum vibratory stress level of ±6.89 x 10^7 N/m^2 (±10,000 lbf/in.^{2}) will be imposed during test operation.

Stator Flutter

Flutter parameters were calculated for both stators and compared with correlated test data. Values of the dimensionless reduced-velocity parameter for bending flutter ($2V/c\omega_b$) calculated for stators 1 and 2 were 2.1 and 1.4, respectively, which are within the successful (no flutter) area determined through experience. A similar conclusion was indicated by the values of reduced-velocity parameter ($2V/c\omega_t$) for torsional flutter, which were computed as 2.05 and 1.87 for stators 1 and 2, respectively.

INTERSTAGE SEALS

The resonances were checked for the interstage rotor sideplate and stator seals (Figure 9) because of the long, cantilevered, stator inner-shrouds required for acoustic considerations. Frequencies of the seals were obtained from shell revolution structural analysis programs. The hoop stiffness effects of the stator inner shroud honeycomb construction were included in the vibration analysis. Resonances for all rotor and stator seals are above the 25 percent frequency margin requirement at 105 percent of design speed, as shown in Figures 54 and 55.

SONIC INLET SUPPORT STRUTS

Frequencies were calculated for the fan inlet strut using fixed-end conditions. The resulting frequencies are shown in Figure 56. The blade passing frequency for rotor 1 does not excite the fundamental bending and torsion modes. There are no low order resonances (1E and 2E) in the operating range. Static load (one-G) plus the maximum aerodynamic load on the centerbody causes a maximum stress of 2.95 x 10^7 N/m^2 (4280 lbf/in.^{2}) on the inlet struts at the inner and outer diameter fillet welds. This is well below the allowable stress of 54.5 x 10^7 N/m^2 (79,000 lbf/in.^{2}) for the AMS 5613 material used. The dimensionless, reduced-velocity parameter ($2V/c\omega_b$) for bending flutter was calculated to be 1.25, within the successful (no flutter) area determined through experience. The torsional flutter, reduced-velocity parameter ($2V/c\omega_t$) was calculated to be 0.6, also in the stable area.

CRITICAL SPEEDS AND FORCED RESPONSE

A rotor-frame critical-speed analysis was performed to determine the vibrational characteristics of the fan, with and without the sonic inlet configuration. The analysis was based on models which included all significant structural members of the rig and used the spring-mass system shown in Figure 57 for the baseline standard engine inlet cowling and Figure 58 for the sonic inlet.

Baseline Standard Inlet Cowling Configuration

Two critical speeds occur within the rig operating range at 4811 rpm and 8764 rpm for the standard inlet cowling configuration. Two other critical speeds occur at 10,729 rpm and 15,777 rpm, which are above the expected maximum operating speed (8785 rpm). The mode shapes of the 4811 rpm, 8764 rpm and 10,729 rpm speeds are shown in Figure 59. The mode at 8764 rpm has only 1.6 percent of the total of the rotor strain energy and, hence, is of little concern. The modes at 4811 rpm and 10,729 rpm have significant motion of the fan rotors and have more than 25 percent of the total strain energy in the rotating components. To determine whether a bearing damper is needed to reduce the vibratory amplitudes of these modes, a forced response analysis was performed on the system with and without a front bearing damper for these two critical speeds. This analysis was similar to the critical-speed analysis except that an unbalance was simulated and the resultant vibratory deflections calculated. Deflections were calculated at the first-stage rotor plane and at the flexible diaphragm behind the second bearing for an unbalance of 72×10^{-5} kg-m (one oz-in.).

A damper was chosen for the front bearing due to the relatively high 7.6×10^{-4} m (0.030 in.) deflection at the rotor for a 72×10^{-5} kg-m (one oz-in.) unbalance at the lowest critical speed without a damper. The damper would reduce this sensitivity to 0.13×10^{-4} m (0.0005in.) per 72×10^{-5} kg-m (one oz-in.). The rotor assembly will be balanced to better than 36×10^{-5} kg-m (0.05 oz-in.) unbalance but may reach 17×10^{-5} kg-m (0.25 oz-in.) during testing. This will give a maximum deflection of 0.030×10^{-4} m (0.00012 in.) at the rotor at 4811 rpm and 0.46×10^{-4} m (0.0018 in.) at 10,729 rpm, well within the tip clearance tolerance. Vibration accelerometers and amplitude pickups will be used to monitor rig and drive system vibration during testing.

Sonic Inlet Configuration

The addition of the sonic inlet did not change the critical-speed predictions of the standard inlet fan although it did create two additional natural frequencies at 2215 rpm and 8909 rpm, both out of the normal operating range. The mode at 8909 rpm, although close to the 105 percent speed line, should not present a problem since only a rather small fraction of the rotor strain energy is involved.

An analysis was made to determine the amount of radial "closure" at the sonic inlet throat in its fully extended position due to static (one - G) stress and dynamic deflections at all critical speeds. A schematic is presented in Figure 60 defining radial closure and showing the relative locations of the centerbody and bearing supports. The static (one - G) radial closure at the throat is 2.3×10^{-4} m (0.009 in.). The maximum total inlet throat dynamic closure in the operating range due to a 0.51×10^{-4} m (0.002 in.) deflection at each bearing support is 2.3×10^{-4} m (0.009 in.) static plus 2.5×10^{-4} (0.010 in.) dynamic, for a total of 4.8×10^{-4} m (0.019 in.) occurring at 8685 rpm. This total deflection is judged to be acceptable, and the probability of any resulting wall-separation or inlet total pressure distortion should be minimal. The effect of structural damping, not included in this analysis, will reduce the dynamic deflections further.

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ACOUSTIC DESIGN

Known concepts of low noise turbofans were incorporated in the design of this two-stage fan. A low tip-speed and moderate design aerodynamic loadings were chosen to minimize generated noise. The number of blades and vanes were chosen to "cutoff" blade-passing tones, and an axial blade spacing of two chords was selected to minimize blade interaction noise. However, to meet the extremely low levels implied by FAR 36 minus 20 PNdB, the basically quiet fan must also incorporate extensive noise suppression in the inlet and exhaust duct. The noise spectra of the basic fan design were estimated, and the desired noise attenuations identified. Acoustic treatment was selected using both analytical and empirical models, and a final prediction of noise reduction was made. A sonic suppression device was selected to attenuate inlet radiated noise in lieu of inlet acoustic splitters (Appendix E). An aft acoustic splitter was incorporated to provide the required suppression of aft radiated noise.

SONIC INLET, ACOUSTIC CONSIDERATIONS

An inlet operating with a completely choked throat does not transmit sound upstream. In a rig or engine, the exact variation of attenuation as throat Mach number increases toward 1.0 is a function of the details of the inlet design. Extensive information on this subject is available in the literature and from a variety of tests performed at Pratt & Whitney Aircraft. At full choke, the amount of attenuation that can be measured is not a function of design but depends on flanking path and background noise levels. The sonic inlet for this rig was designed for a Mach number of 0.9 with the capability of running at full choke or less. In order to allow operation at part-choke conditions for reduced distortion generation, a limited amount of acoustic treatment was incorporated in the sonic inlet design so that full-choke noise attenuation characteristics could be approximated. Selection and design of the sonic inlet for this rig were based on aerodynamic, structural and engine compatibility considerations that are described in the Inlet Aerodynamic Design section of this report. The only acoustic design criterion used was that the flow disturbances produced by the sonic inlet hardware be minimized so that aft-radiated fan interaction noise could be kept as low as possible.

A translating centerbody was selected as the most practical compromise among acoustic, aerodynamic, and mechanical design criteria. The centerbody will be tested in three axial-positions representing the ATT engine (STF 433 engine) [ref. 1] conditions of cruise (design), takeoff, and approach with the latter two positions having capability of sonic inlet Mach numbers.

FLOWPATH AND BLADE GEOMETRY

To reduce the interaction tone noise at blade-passing frequency, the numbers of fan blades and vanes were chosen using the Tyler-Sofrin criterion [ref. 8] which specifies that if the number of stator vanes (s) is greater than twice the number of rotor blades (r), interaction noise generated at subsonic tip-speeds will decay within the inlet and exit ducts of a fan. The numbers actually selected (see Tables VI and VII) satisfy the relationship $s = 2r + 6$ for all adjacent blade row combinations except stator -1/rotor -2 which, due to mechanical and aerodynamic constraints limiting the number of stator 1 vanes, satisfies the relationship $s = 2r - 8$.

Axial spacings between blade rows were selected to reduce a residual blade-passing tone noise associated with blade/vane wake interactions. As shown in Figure 61, this noise component decreases rapidly as spacing is increased up to two or three chord lengths relative to the upstream blade row. After two or three chords spacing, further reductions in noise cannot be obtained without severe weight and length penalties. The values selected for the configuration to be tested in the current program are two aerodynamic tip chord lengths; however, the capability for alternate closer spacing is provided in the mechanical design of the rig.

An additional noise control feature was incorporated in the fan design for psychoacoustic purposes. A ratio of blades 35/28 (=5/4) in the two stages was chosen to avoid, as far as possible, dissonant chords usually present in multistage machines. This ratio is called a "major third" in musical theory and, by western standards, is considered "consonant". Psychoacoustic tests, using oscillators and a broadband noise generator, were run at P&WA to simulate a number of twin rotor builds. Rotor frequency ratios selected according to musical principles was found to produce less annoying spectra than those selected randomly, but this advantage held only at low frequencies, roughly below 1000 Hz. At higher frequencies typical of flight operations (approach and takeoff), the advantage of harmonius tones tended to disappear. However, the harmonic ratio concept was retained in the subject two-stage fan since it could do no harm and should provide a less annoying spectrum at speeds corresponding to some airport ground operating conditions, such as taxiing and idling.

RIG SPECTRA PREDICTIONS

As in the case of the full scale ATT engine (STF 433), noise spectra for the two-stage rig were predicted using one-third octave band data for an existing two-stage fan engine, the JT3D. This procedure may appear to have a disadvantage in that the differences in the ratio of the number-of-rotor-2-blades/number-of-rotor-1-blades, 35/32 in the JT3D and 35/28 in the present rig, prevent accurate spectral simulation. However, the $35/28 = 1.25$ ratio is sufficiently close to 1.26 ($\sqrt[3]{2}$) to insure that both rotor tones are in neighboring third octave bands, so that for purposes of PNdB calculations and for selecting sound absorbing liner parameters the predicted spectral shapes should be satisfactory.

To predict the rig spectrum at a particular condition (e.g., approach), the blade linear tip speed was found for the approach RPM. At this tip speed, fan data from the JT3D engine were selected. To convert these spectral data to the higher rig blade-passage frequencies, the one-third octave JT3D spectra were shifted to the right by the required number of third octaves.

Next, corrections for changes in size, blade-vane spacing, and pressure ratio were applied, as noted below. A correction of 2 dB was added to each frequency band to allow for the estimated increase in aft radiated noise associated with use of the sonic inlet. This amount was obtained from a set of choked inlet tests run on a JT8D engine in the late 1960's and represents both the backscattering at the sonic throat of forward propagating sound and additional noise generation caused by blade interaction with inlet flow velocity disturbances produced by the sonic inlet hardware.

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The corrections mentioned above were as follows:

- Blade-vane spacing,   dB = 10 log (projected chord ratio) = −3.5 dB

- Fan size correction,   dB = 20 log (diameter ratio) = −3.9 dB

- Fan pressure ratio,   dB = 20 log (pressure rise) = +3.8 dB

The spacing correction was applied in the third octaves containing blade-passage tones; other corrections were applied across the spectrum. These corrections were based on results of an FAA funded fan noise research program (Contract No. DOT-FA69WA-2045) and extensive documentation of P&WA engine noise characteristics. They were incorporated into a computer program that predicts the spectral characteristics of study engines.

The resulting predicted rig source sound-pressure-level (SPL) spectra at a 45.7 m (150 ft) radius for the angle of maximum perceived-noise-level (PNL) aft of the rig are presented in Figure 62.

TREATMENT ATTENUATION TARGETS

To determine the appropriate acoustic treatment, the dominant annoying frequency range first had to be identified. For the inlet, this is described under Acoustic Treatment Selection. For aft noise, the dominant annoying frequency range was determined from source noise spectra transformed into subjective "NOY" values. These spectra were simply truncated until a required integrated value of target attenuation was established for the aft noise. Since the full-scale engine study [ref. 1] predicted a level just at FAR 36, and the goal of this contract is to achieve levels of FAR 36 minus 20 PNdB, a target attenuation of 20 PNdB was set as the treatment goal. Figure 63 shows the resulting aft attenuation spectrum at approach and takeoff with a peak attenuation near 3500 Hz.

ACOUSTIC TREATMENT SELECTION

Inlet

To provide improved attenuation of forward-radiated noise during operation with the sonic inlet not at full choke, a limited amount of treatment was applied to the walls of the sonic inlet. The inlet treatment was designed to be mainly effective in absorbing the upstream traveling waves (i.e., treatment was tuned to attenuate waves propagating forward from within the fan). The forward attenuation spectrum expected from the inlet treatment is shown in Figure 64 and represents a preceived noise level of 3 PNdB.

The inlet treatment was restricted to axial locations where the wall Mach number does not exceed 0.7 at any of the operating points. Flow separation at the wall could occur because of surface roughness in a region of flow diffusion if the treatment had been extended to regions of higher Mach number. With the translating centerbody in the forward (approach) position, the lengths of treatment exposed are approximately 0.482 m (19 in.) on the inner wall and 0.599 m (22 in.) on the outer wall to provide a treatment length to passage height

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ratio of about 1.6. Retraction of the centerbody covers the treatment on the inner wall and reduces the ratio by about one-half. Backing depth is 0.635 cm (0.25 in.) and design facing sheet percent open area is six percent both for the inner and outer wall treatments. These values were chosen, in accordance with methods described in the next section, to tune the inlet treatment to the center of the inlet attenuation target spectrum.

Interstage and Aft Fan Duct

The treatment in the interstage region was selected to attenuate the lowest blade-passing-frequency (28E at approach); the long aft duct treatments, including treatment on the inner and outer walls and on both sides of the single splitter, were tuned for the center of the target, about 3200 Hz (Figure 63). On the basis of empirical data, including curves of tuning versus backing depth and PNL reduction versus treatment-length to duct-height ratio, this single splitter configuration was found to be superior to the no-splitter and two-splitter designs. By selection of deeper backing depths for the duct wall treatment and more shallow depths for the splitter, a relatively thin, 0.016 m = (0.62 in.) splitter was possible and a minimum blockage achievable. At the same time, the attenuation spectrum, compared to a spectrum for the splitter and wall treatment tuned to the same frequency, could be broadened to cover the attenuation target. The facing sheet values shown in Figure 65 were chosen for an optimum combination of bandwidth and peak attenuation rather than for peak attenuation alone.

Preliminary estimates of required treatment area were made by reference to guideline curves of PNdB reduction as a function of treatment-length to passage-height ratio (L/H) such as shown in Figure 66. This figure contains data from various tests, including several NASA funded programs, for fan ducts with L/H ratios up to 23. It has been observed in axial traverse tests at P&WA that the flattening of these curves at higher values of L/H is not due to a failure of long treatments to attenuate fan noise but rather to the limiting effect of flanking path noise and the presence of other noise sources, such as jet noise, on the overall observed attenuation spectrum. For the current program, NASA Quiet Two-Stage Fan Rig, an axial length of about 1.016 m (40 in.) available for treatment and a passage height of 0.178 m (7 in.) would result in L/H ratios of about 5.8 with no splitter, 12 with one splitter, and 20 with two splitters. The cross-sectional blockage of the splitters reduces the passage height, and this has been taken into account. The single-splitter configuration was taken as a starting point for the design on the basis of Figure 66 and various other considerations discussed above.

Tuning curves, such as shown in Figure 67, that relate treatment backing depth to frequency of peak attenuation were used for initial selection of backing depths. Generally, the initial value of facing sheet installed-resistance is taken to be equal to the value of the dimensionless frequency parameter in Figure 67 at the design point. A succession of iterations was then performed in which attenuation spectra were calculated by means of an analytical solution of the wave equation for the principal mode in the duct [ref. 9] for incremented values of backing depths and facing sheet resistances until an optimum coverage of the attenuation target was found.

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PREDICTED ATTENUATIONS — INTERSTAGE AND AFT TREATMENT

On the basis of the procedures previously described, the attenuations shown in Figure 68 were obtained. PNL numbers for takeoff and approach at 45.7 m (150 ft) radius and maximum PNL are summarized in Table XIII.

TABLE XIII

ANALYTICALLY PREDICTED FAN AFT PNL AT 45.7 METER (150 FOOT) RADIUS

CONDITION	DESIGN SPEED	PNL UNTREATED	PNL TREATED	PNL ATTENUATION
Approach	70%	112.3 dB	92.6 dB	19.7 dB
Takeoff	94%	125.0 dB	104.2 dB	20.8 dB

The results of the analytical design system indicate a reduction of approximately 20 PNdB in aft noise.

COMPETING NOISE SOURCES

In tests it is often difficult to realize large predicted values of duct attenuation. Fan jet mixing noise and additional noise generated by the rig fan air scrubbing the test rig afterbody tend to obscure measurements of treated fan noise levels in the farfield. However, empirical estimates of jet mixing noise have determined that at low speeds (e.g., approach) the majority of fan noise attenuation should be measureable at the farfield microphones (Figure 69). Use of narrow band spectral analysis, which increases the ratio of tone to broadband noise, will facilitate detection of fan noise attenuation. Further signal detection will be provided by operating at the widest possible nozzle condition, which reduces the jet nozzle velocity and consequently the jet noise. At higher speeds, the high levels of jet noise will at least partially mask the effect of the treatment (Figure 70).

SYMBOL	% DESIGN SPEED	VANE	M_2 ROOT	M_2 TIP
———	100	S1	0.85	0.61
― ― ―	100	S2	0.66	0.51
◯	85	S1 (REF 3)	0.82	0.59
◐	85	S2 (REF 3)	0.77	0.53
☐	100	S (REF 5)	0.88	0.68

STATOR TOTAL LOSS, $\overline{\omega}$

STATOR

HUB   TIP

SYMBOL	% DESIGN SPEED	BLADE	m/sec	ft/sec	M'_1 TIP
———	100	R1	365.8	1200	1.31
― ― ―	100	R2	329.8	1082	1.08
◯	85	R1(REF 3)	376.1	1234	1.22
◐	85	R2 (REF 3)	305.4	1002	1.10
⊖	95	R1 (REF 3)	419.4	1376	1.12
☐	100	R (REF 5)	304.8	1001	1.40

ROTOR TOTAL LOSS, $\overline{\omega}$

ROTOR

HUB   PERCENT SPAN AT TRAILING EDGE   TIP

Figure 1   Rotor (lower) and Stator (upper) Total Loss Spanwise Profiles
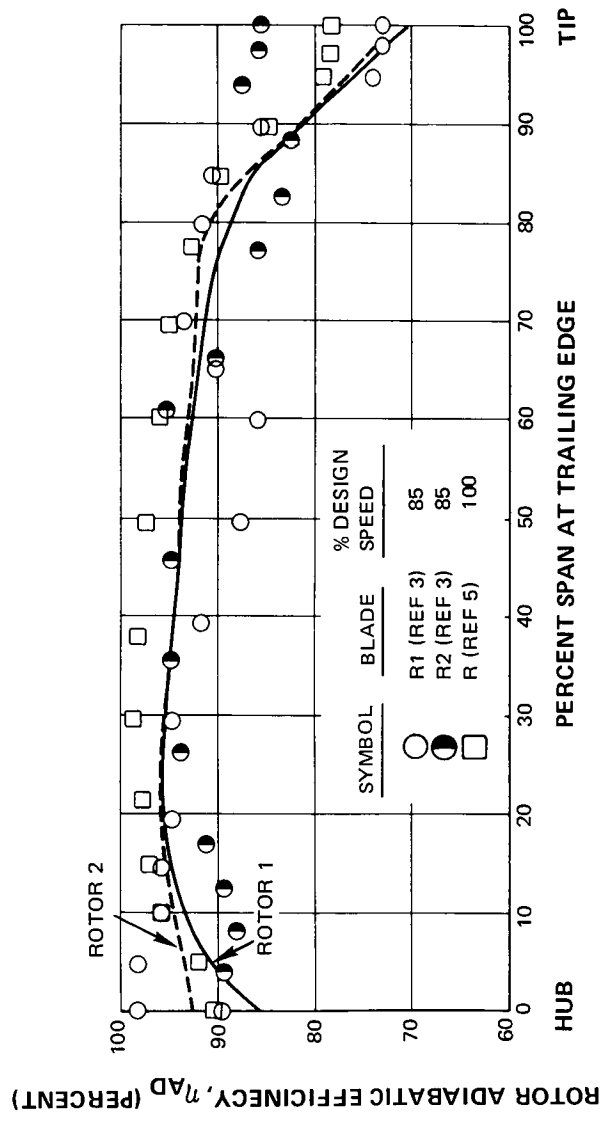
Figure 2   Rotor Adiabatic Efficiency Spanwise Profiles

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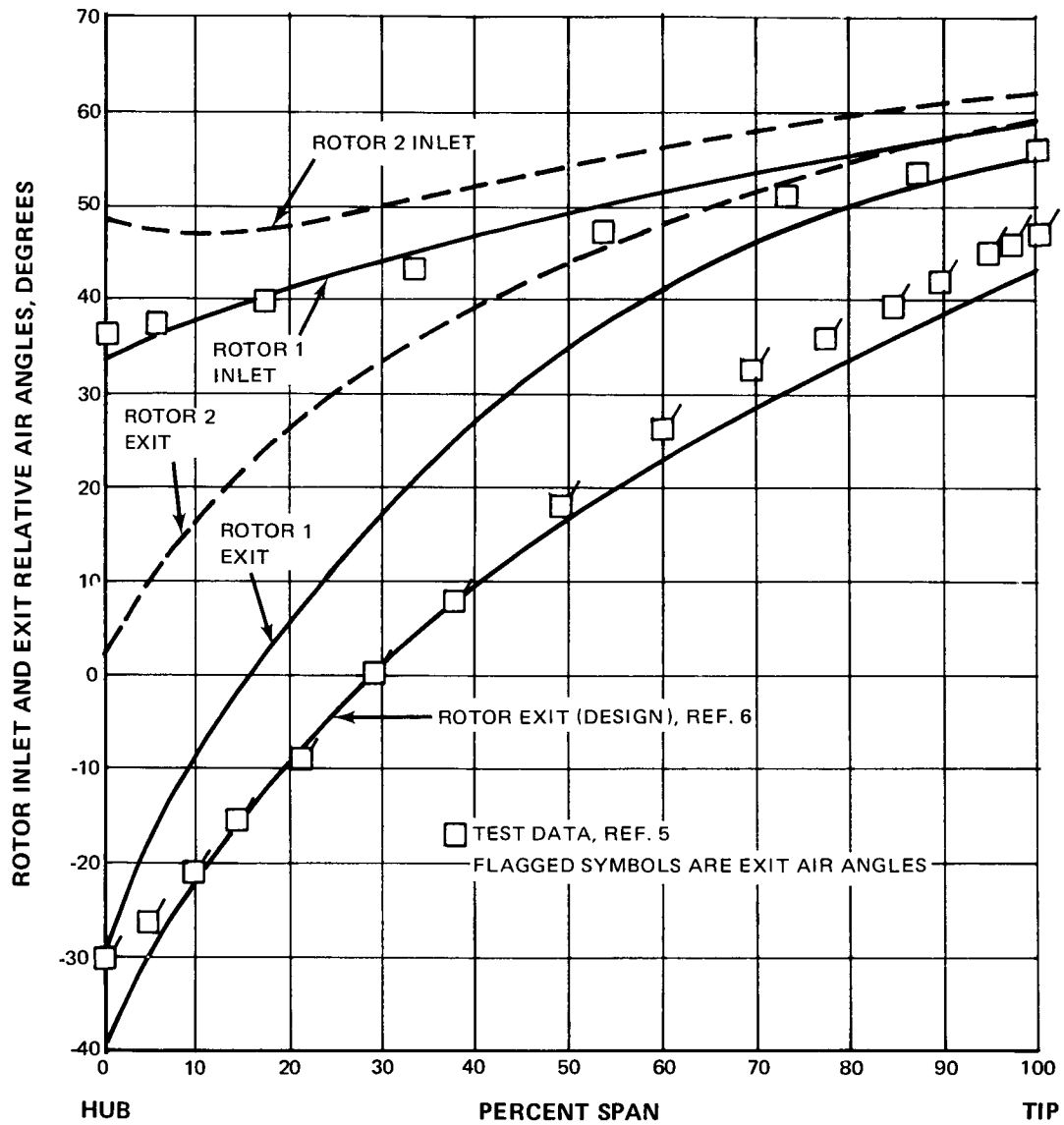
Figure 3   Rotor Inlet and Exit Relative Air Angles Spanwise Profiles
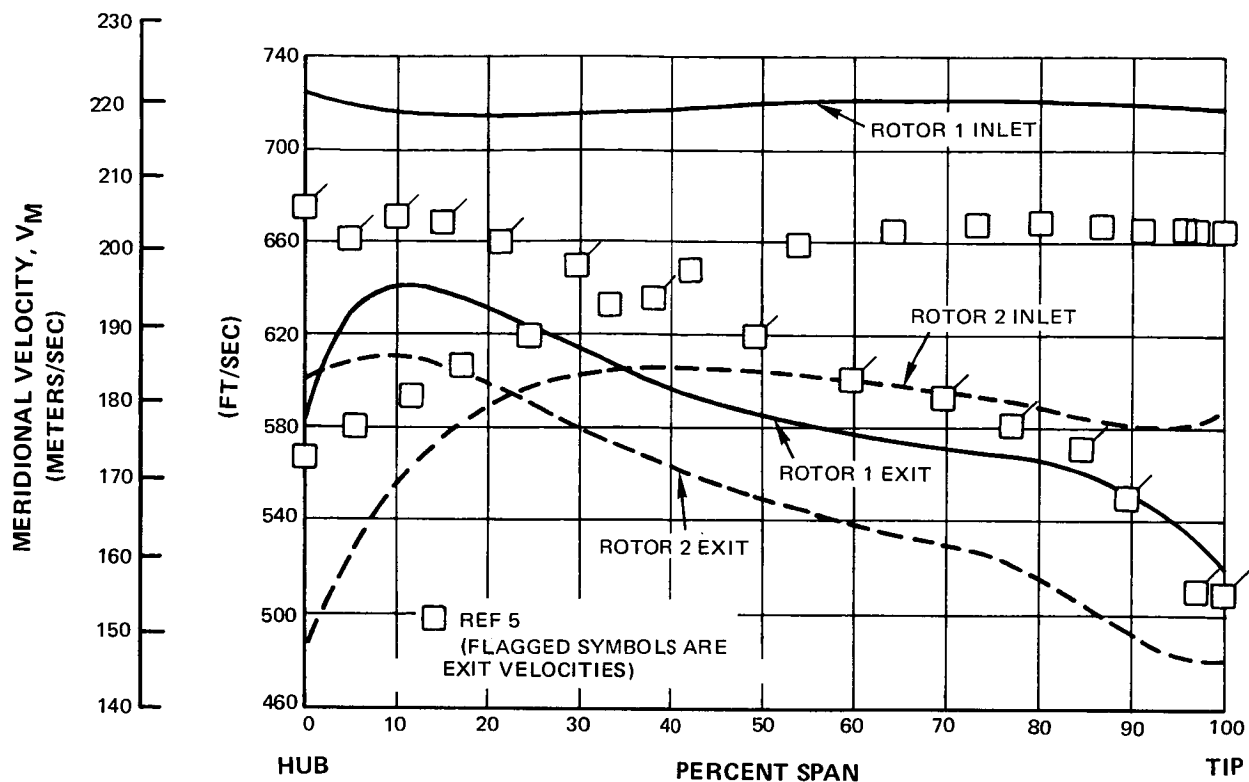
Figure 4   Rotor Meridional Velocity Spanwise Profiles
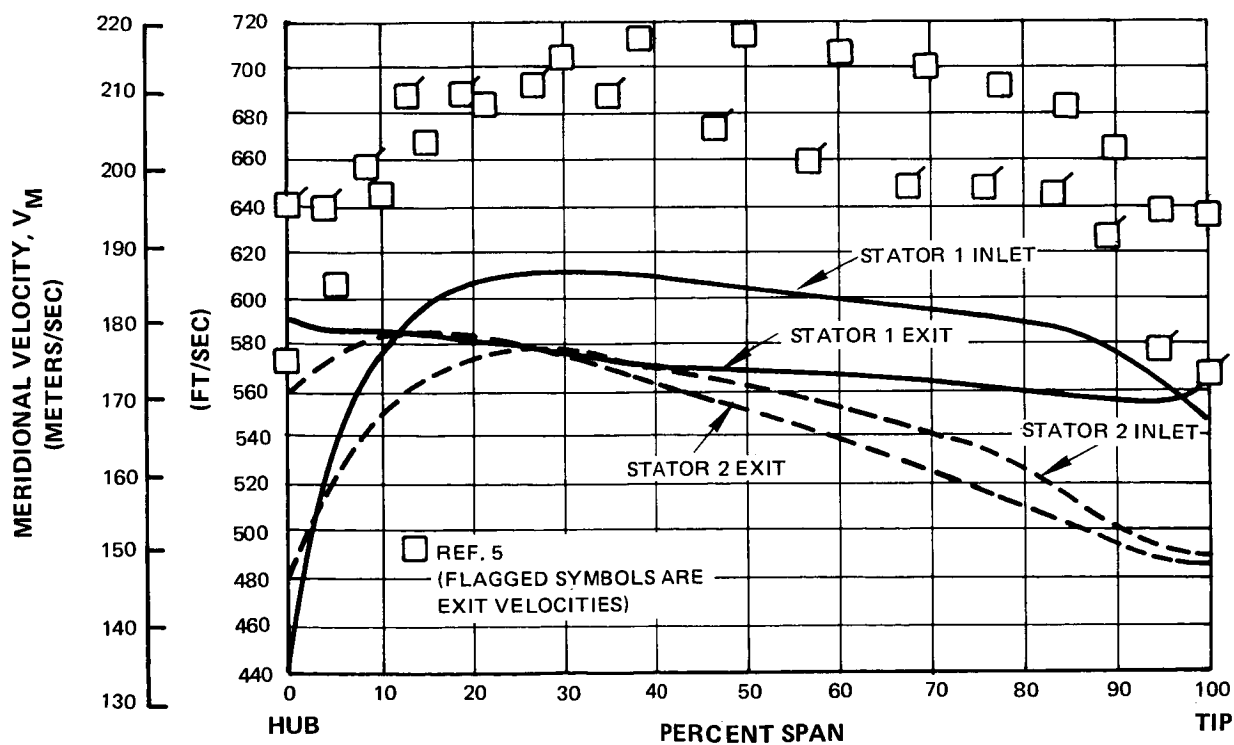
Figure 5   Stator Meridional Velocity Spanwise Profiles
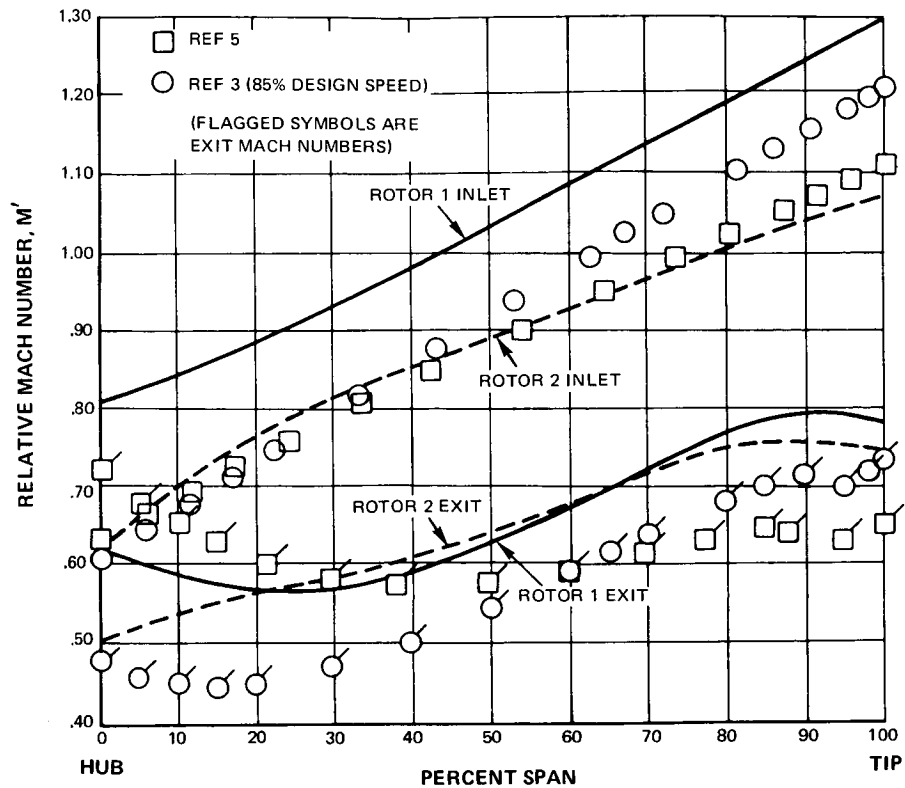
Figure 6   Inlet and Exit Mach Number Spanwise Profiles for Rotors
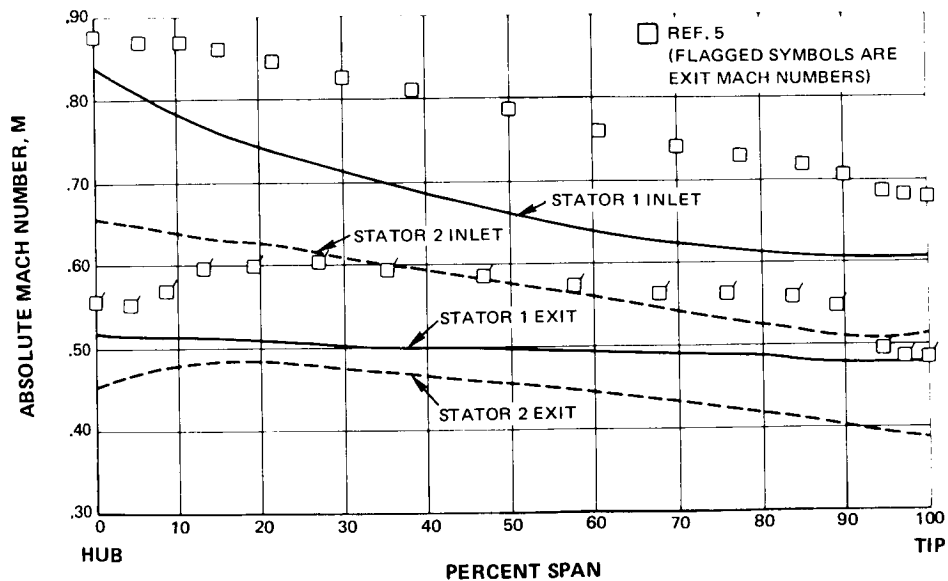
Figure 7   Inlet and Exit Mach Number Spanwise Profiles for Stators

30
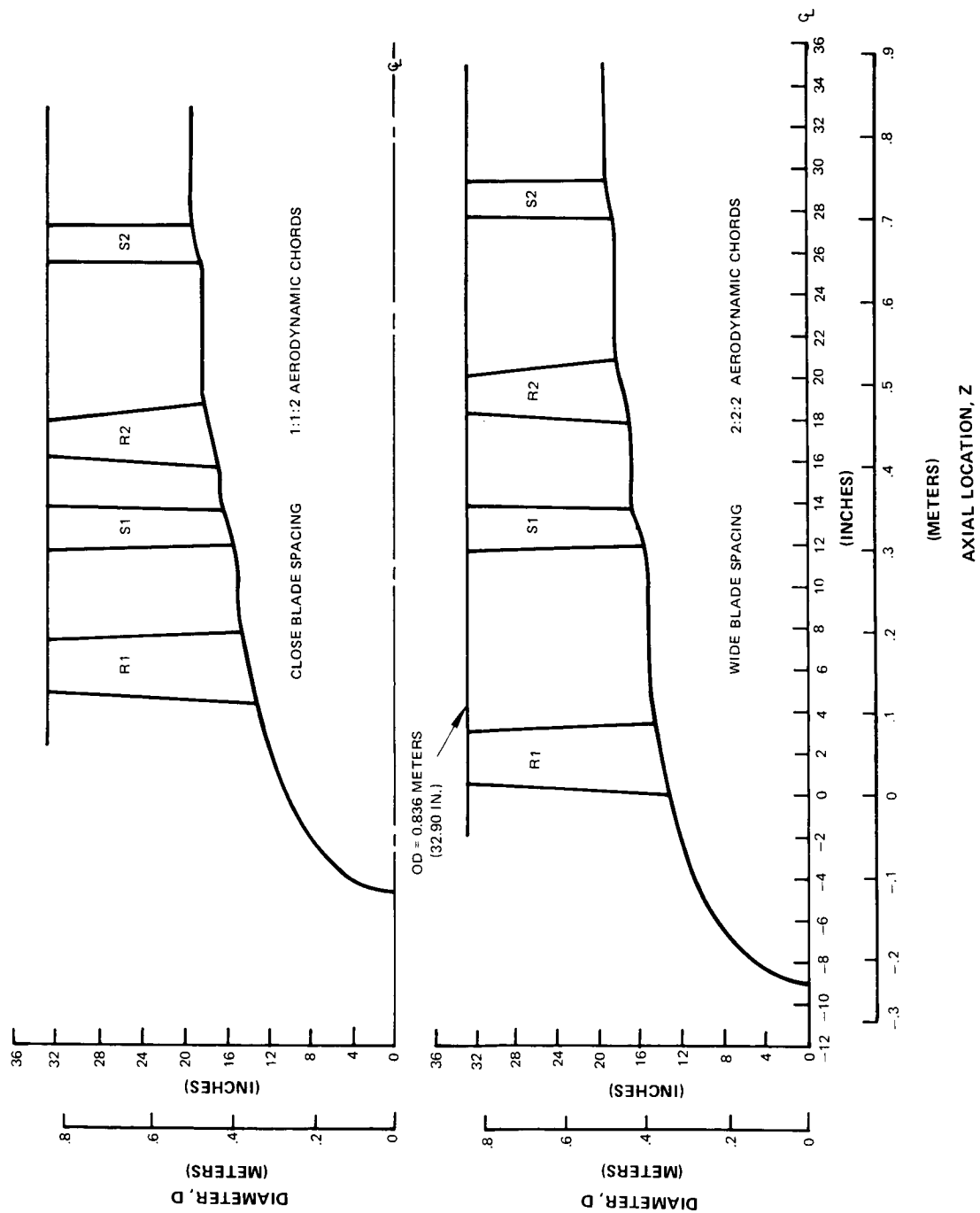
Figure 8   Fan Flowpaths

31
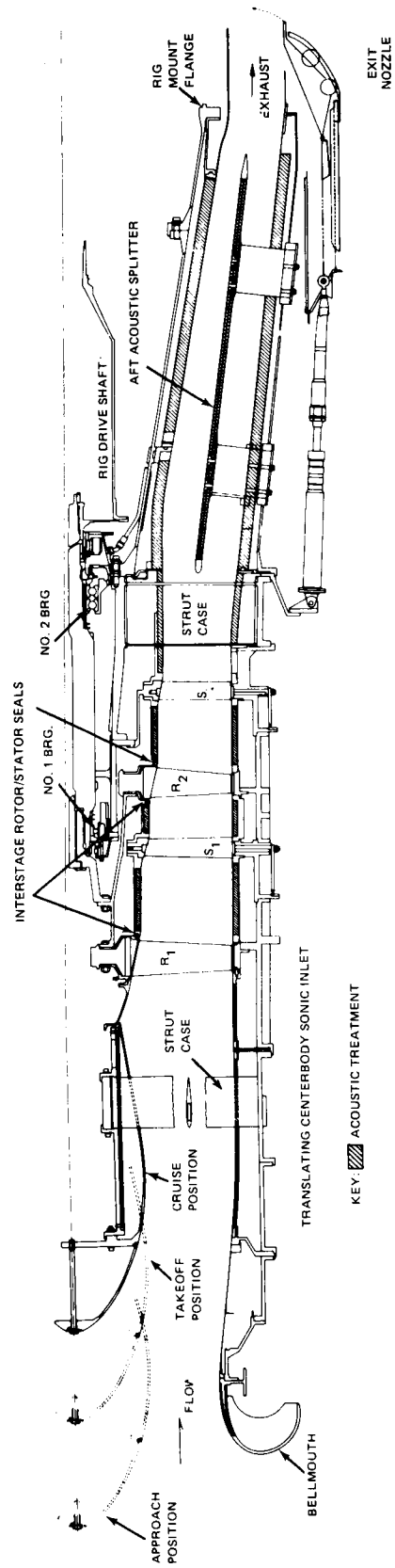
Figure 9   Schematic of the Quiet Two Stage Fan
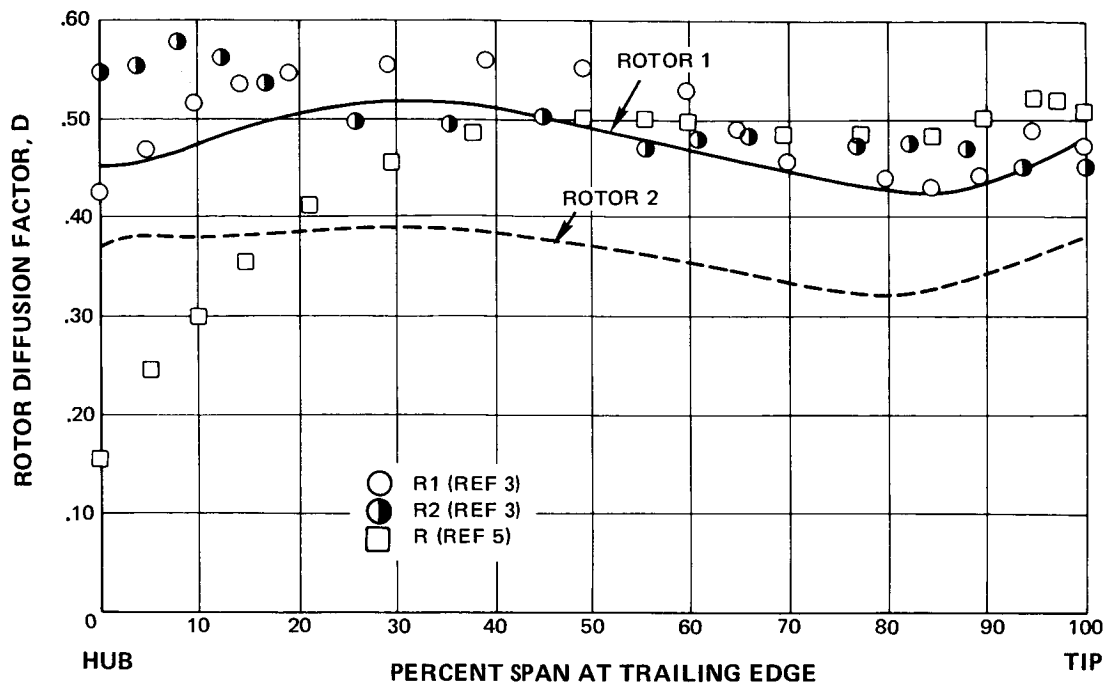
Figure 10   Rotor Diffusion Factor Spanwise Profiles
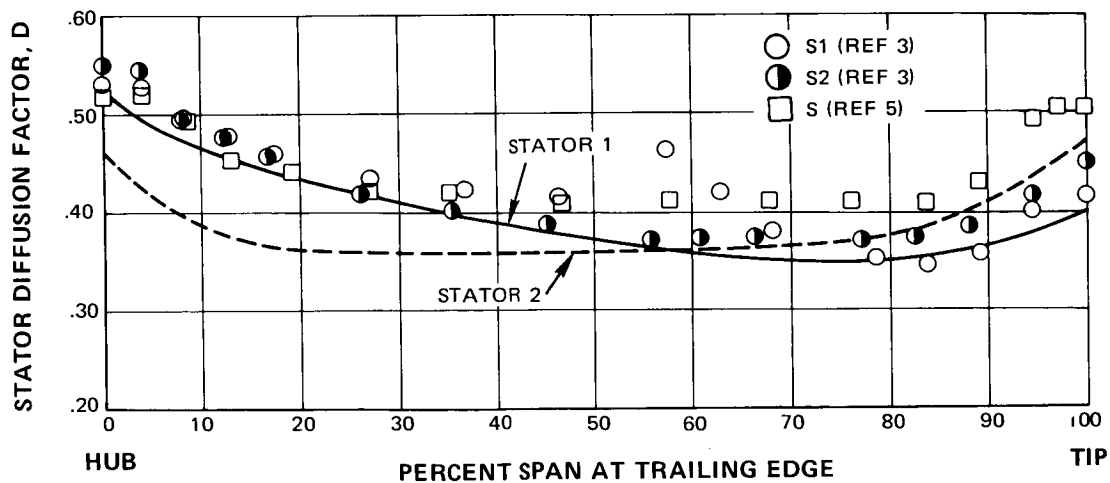
Figure 11   Stator Diffusion Factor Spanwise Profiles
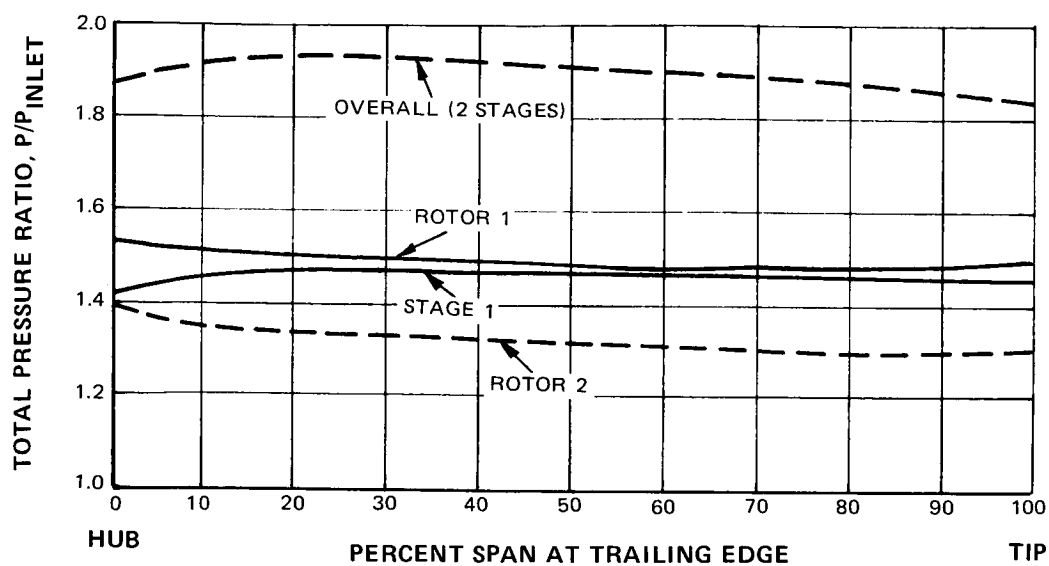
Figure 12   Total Pressure Ratio Spanwise Profiles
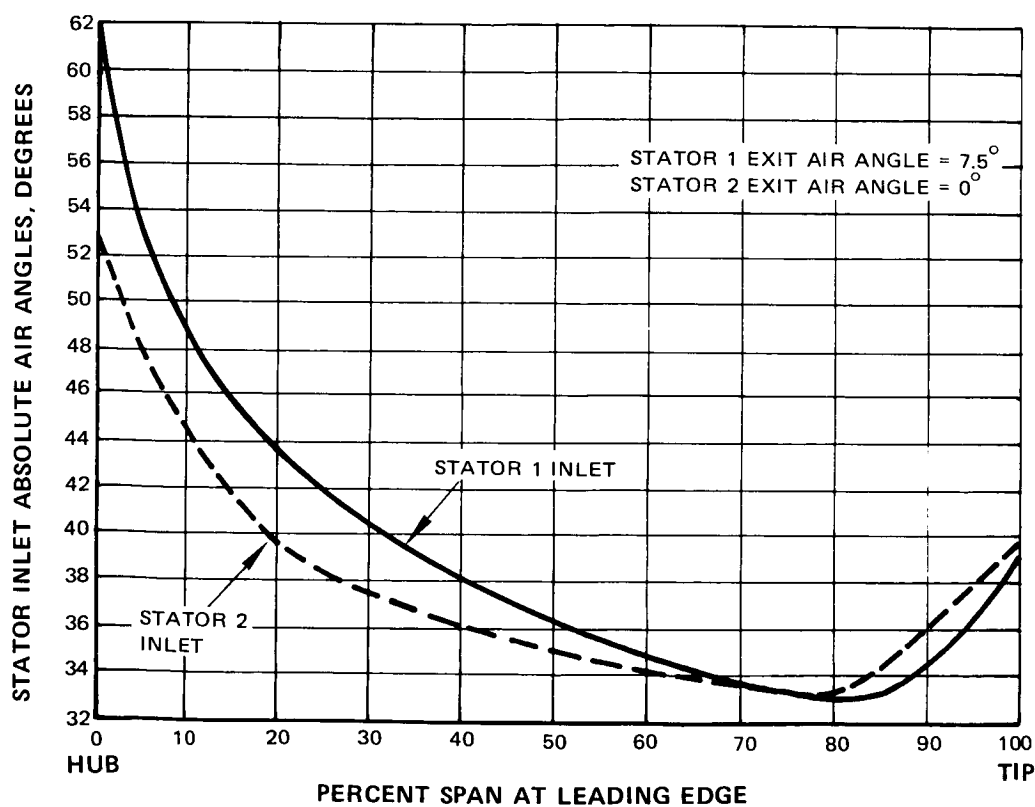
Figure 13   Stator Inlet and Exit Absolute Air Angle Spanwise Profiles

34
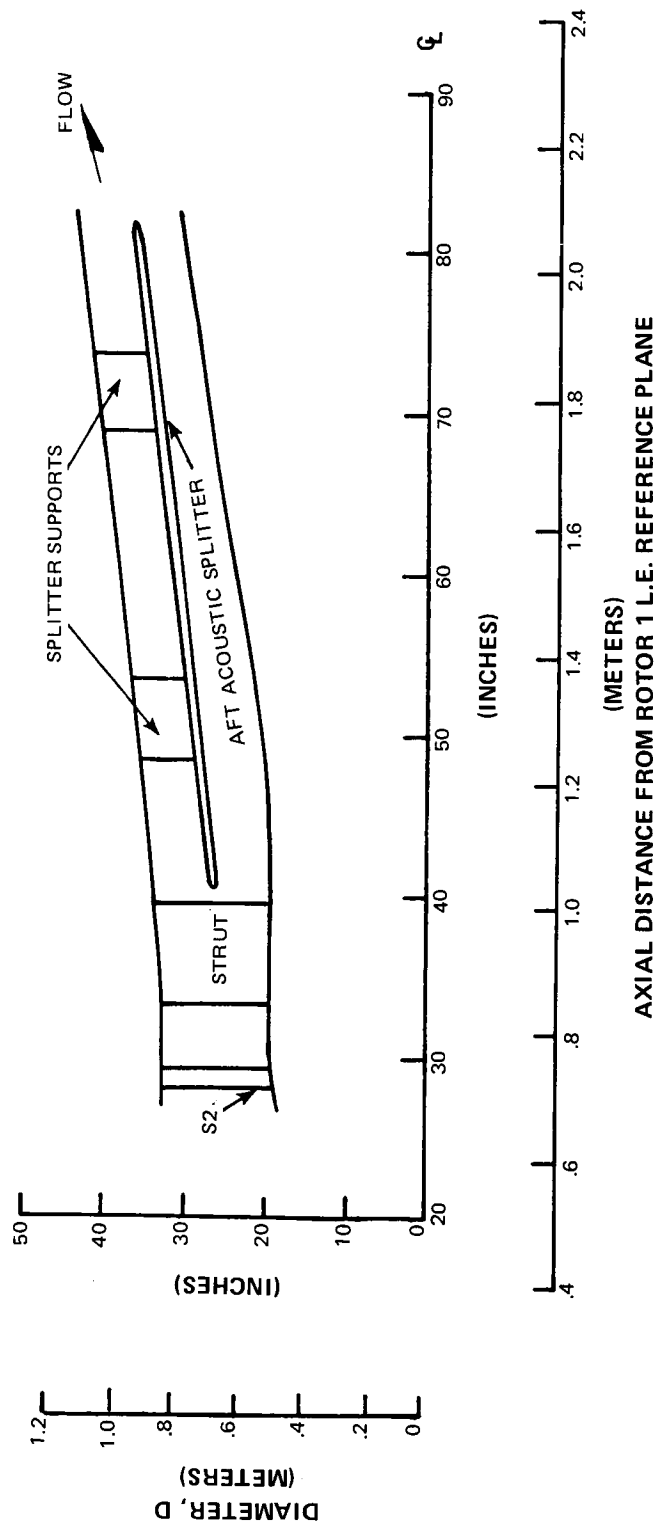
Figure 14   Fan Exit Duct and Acoustic Splitter Flowpath

35
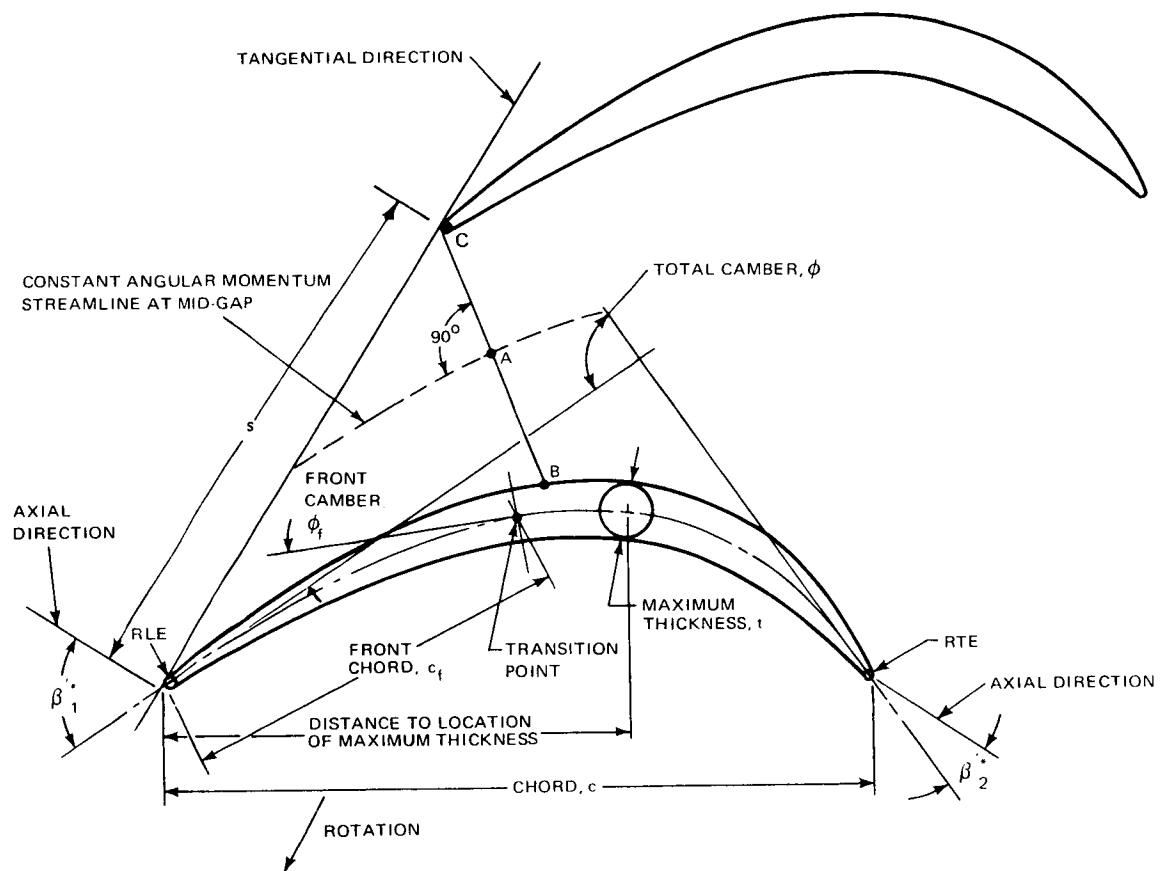
Figure 15   Multiple-Circular-Arc Airfoil Definitions
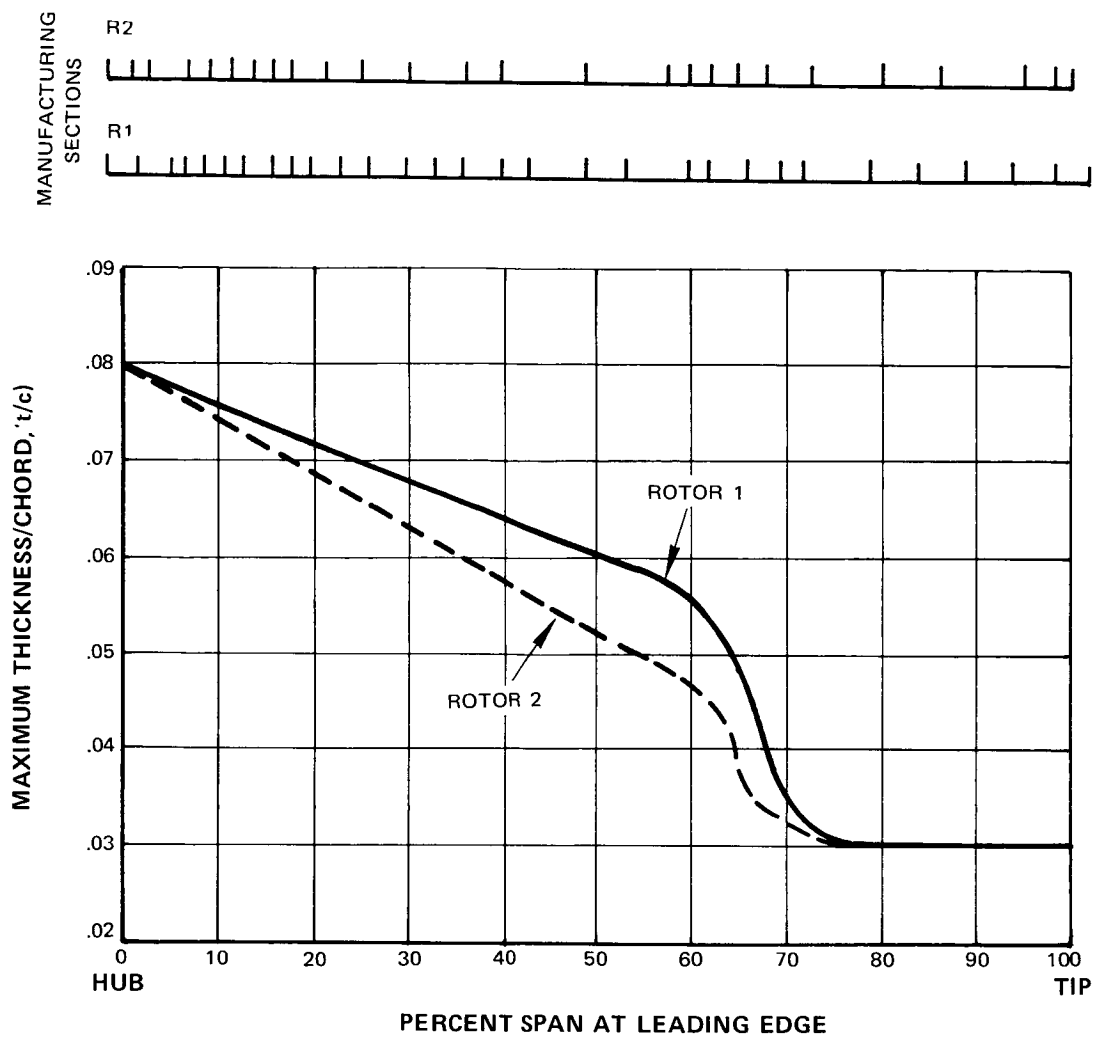
Figure 16   Rotor Airfoil Thickness Spanwise Profiles
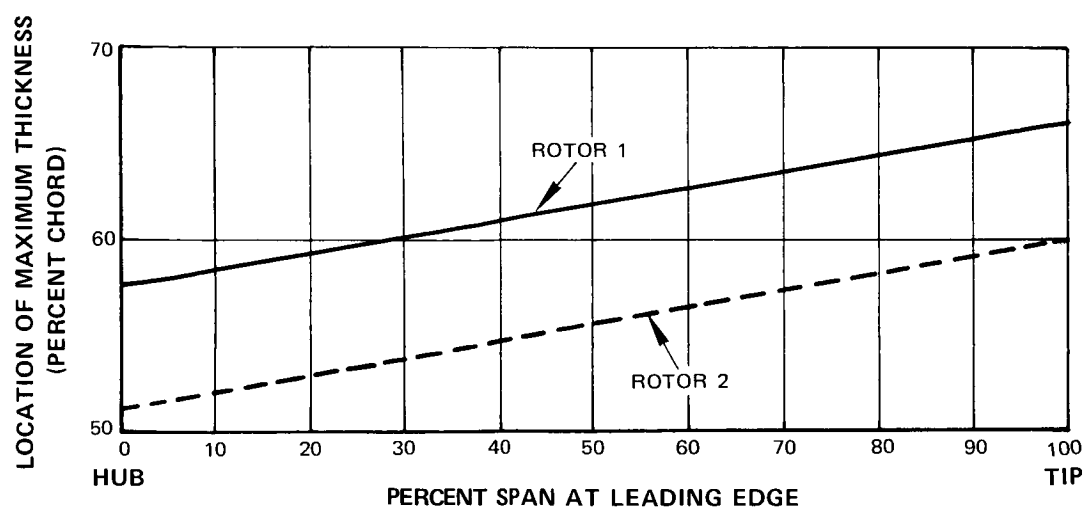
Figure 17   Rotor Chordwise Location of Airfoil Maximum Thickness Spanwise Profiles

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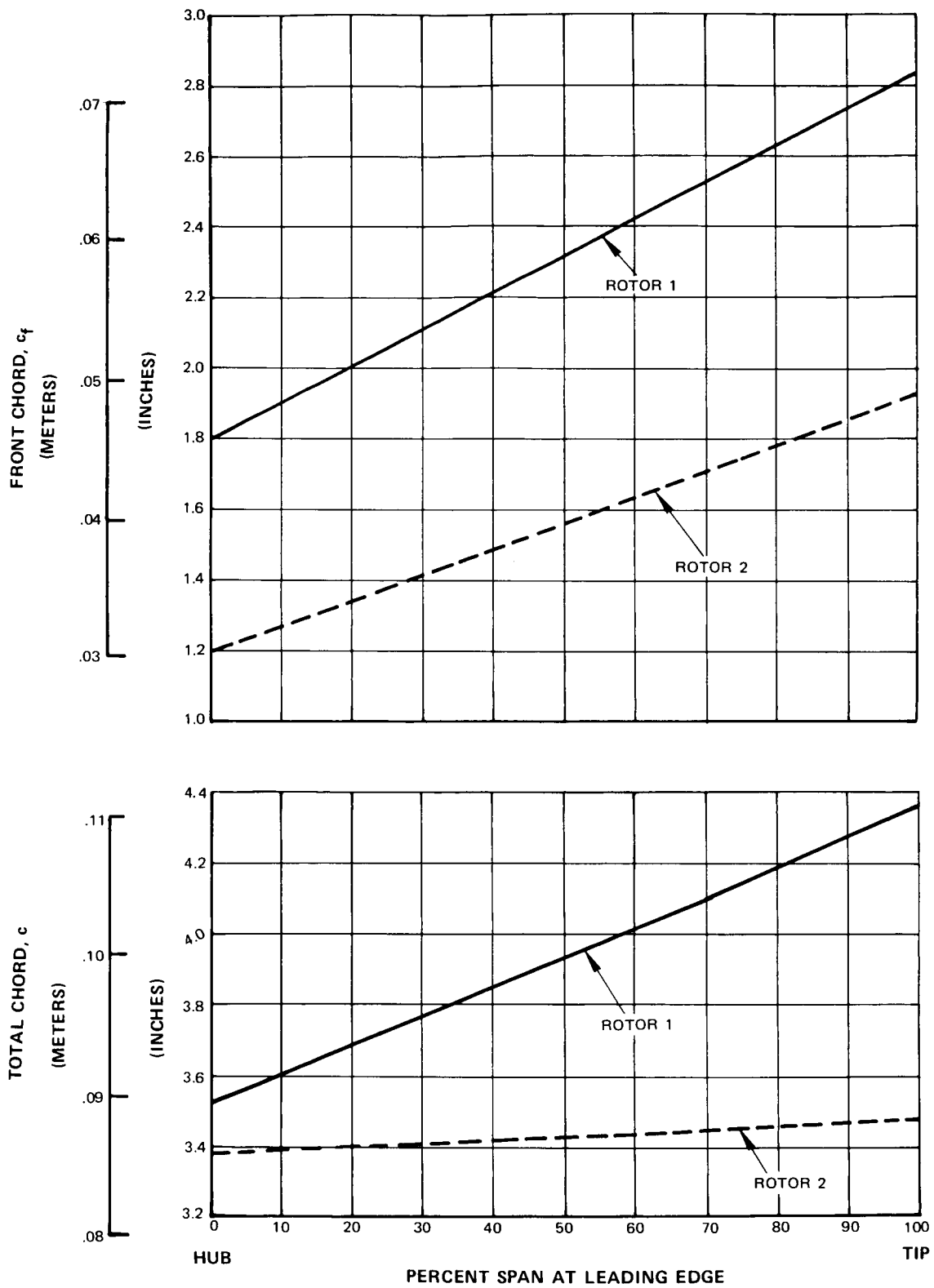
Figure 18   Rotor Chord Spanwise Profiles

38
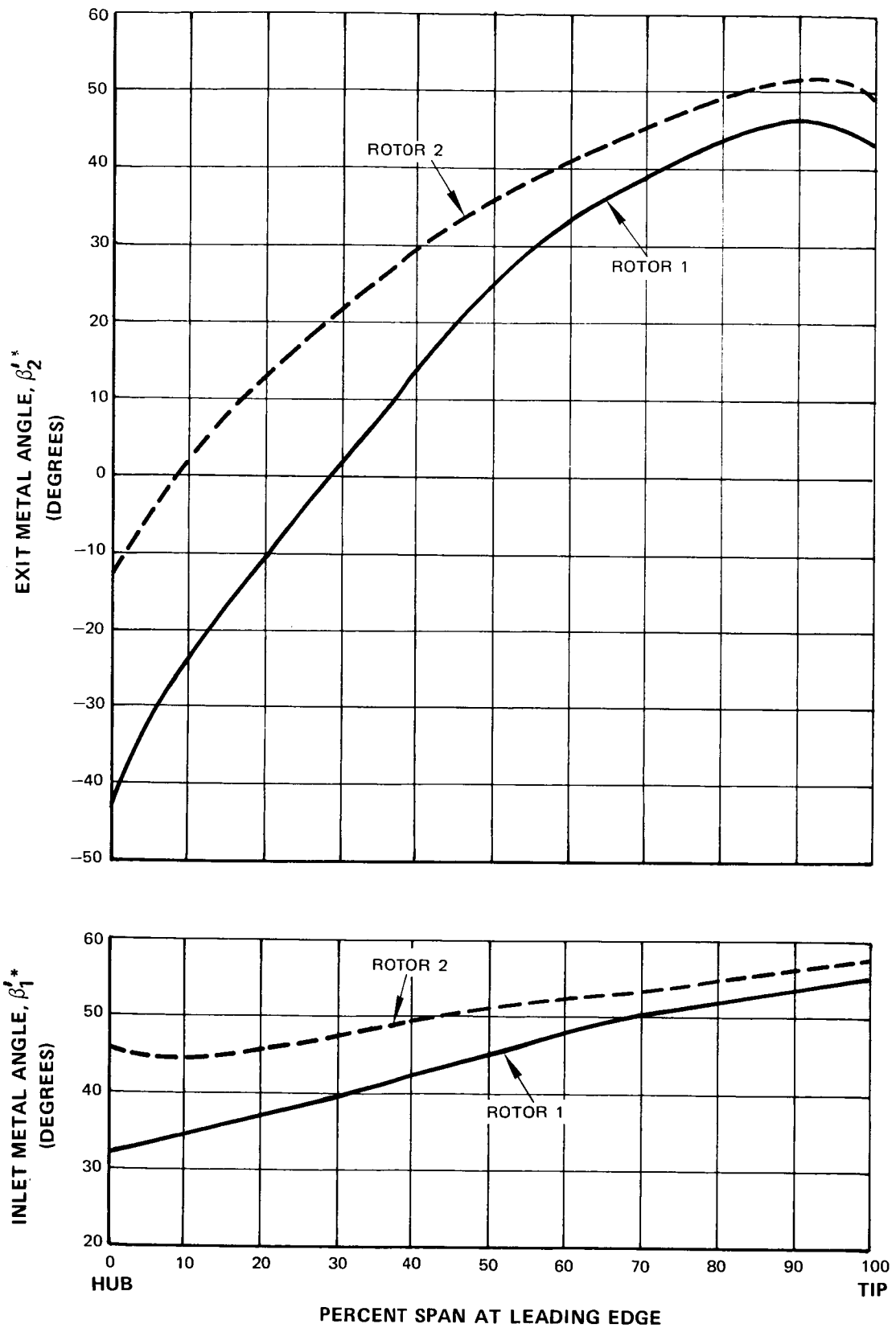
Figure 19   Rotor Inlet and Exit Metal Angle Spanwise Profiles
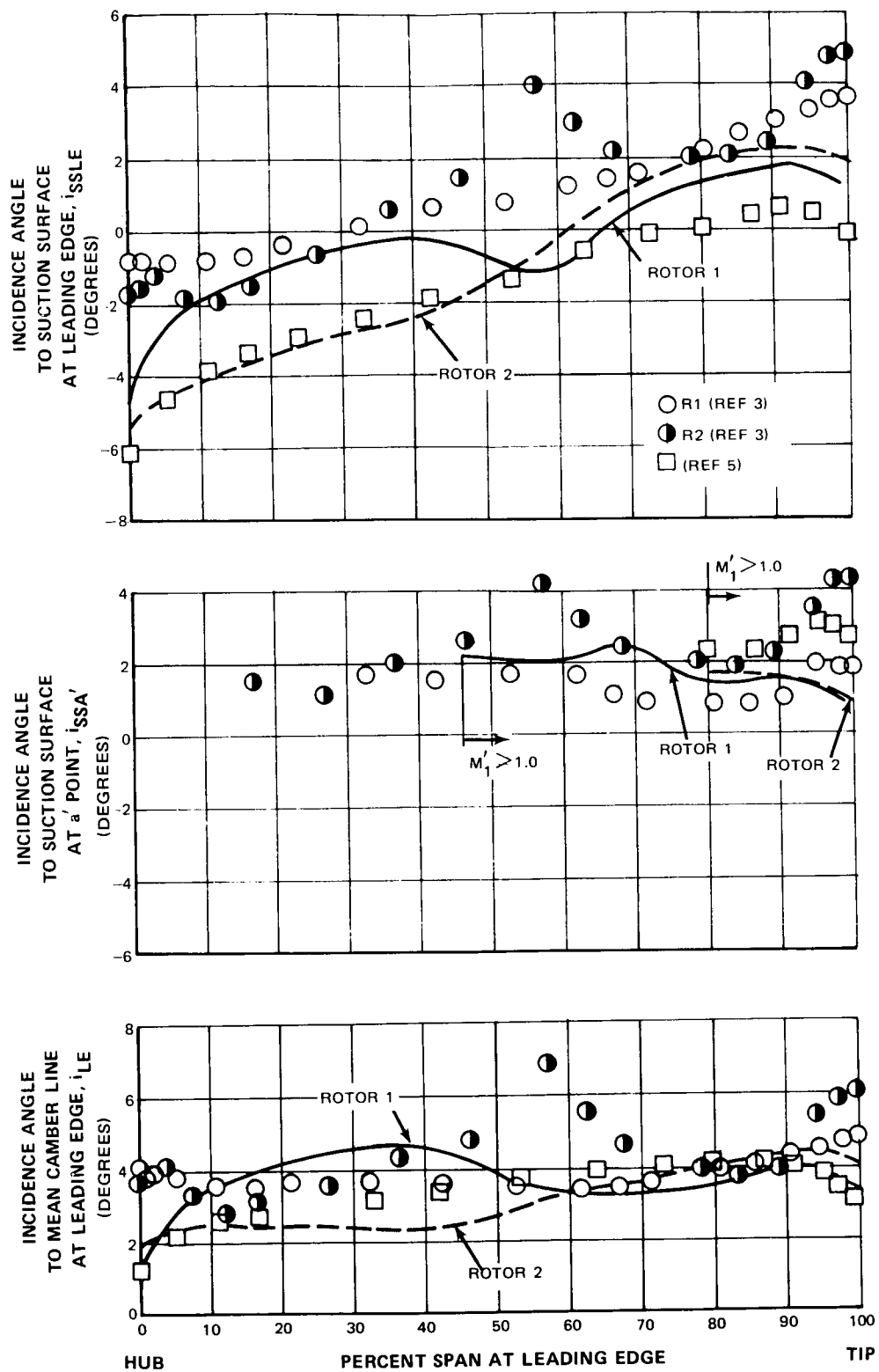
Figure 20   Rotor Incidence Angle Spanwise Profiles
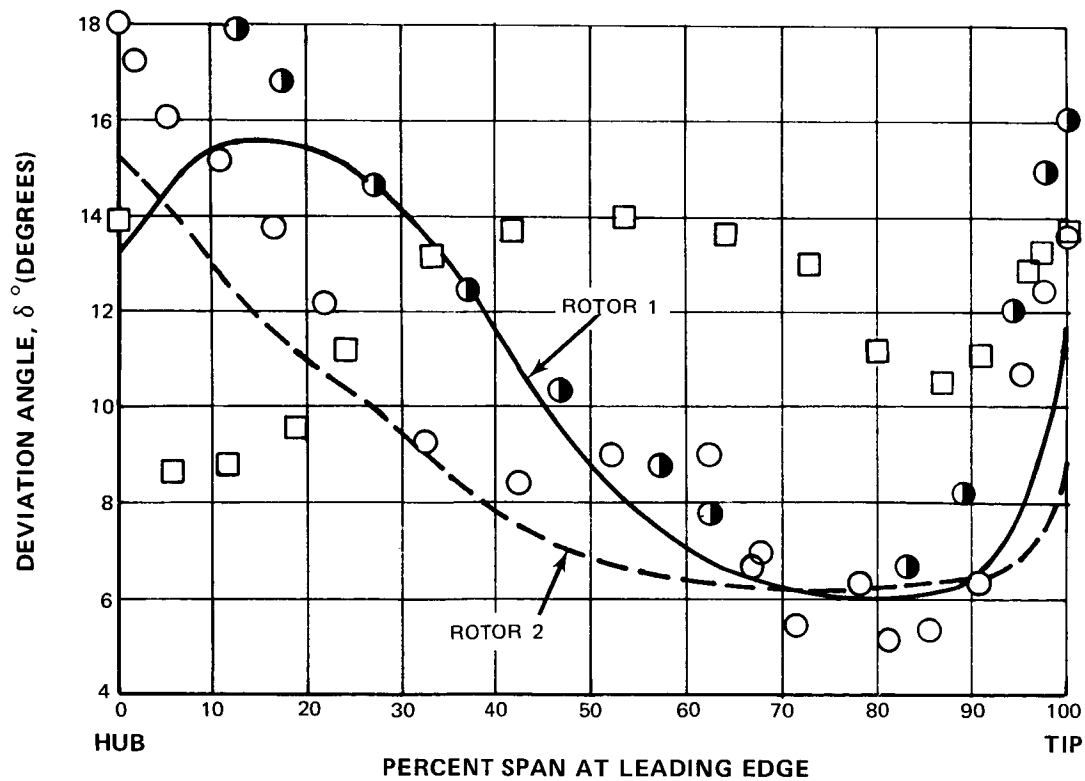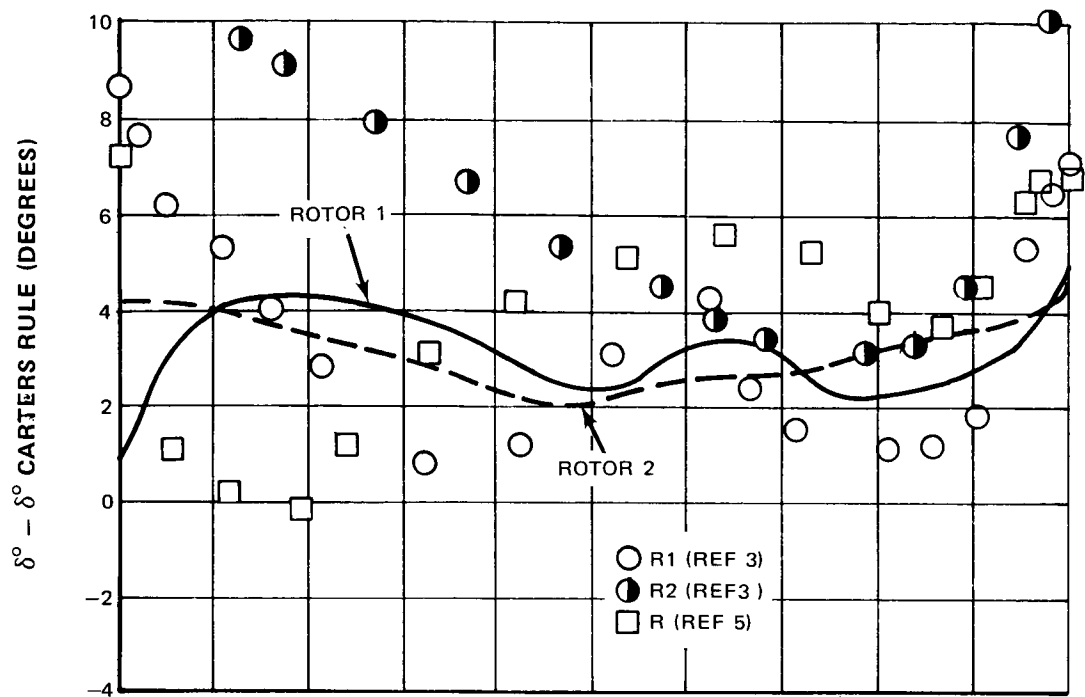
Figure 21   Rotor Deviation Angle Spanwise Profiles
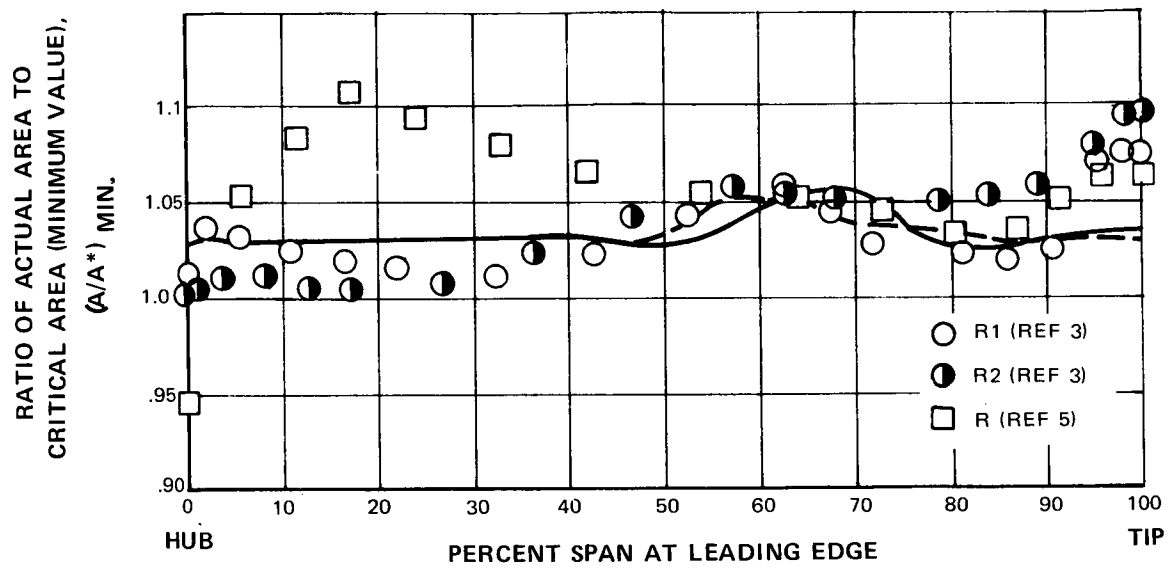
Figure 22   Minimum Rotor Channel Area Ratio Spanwise Profiles
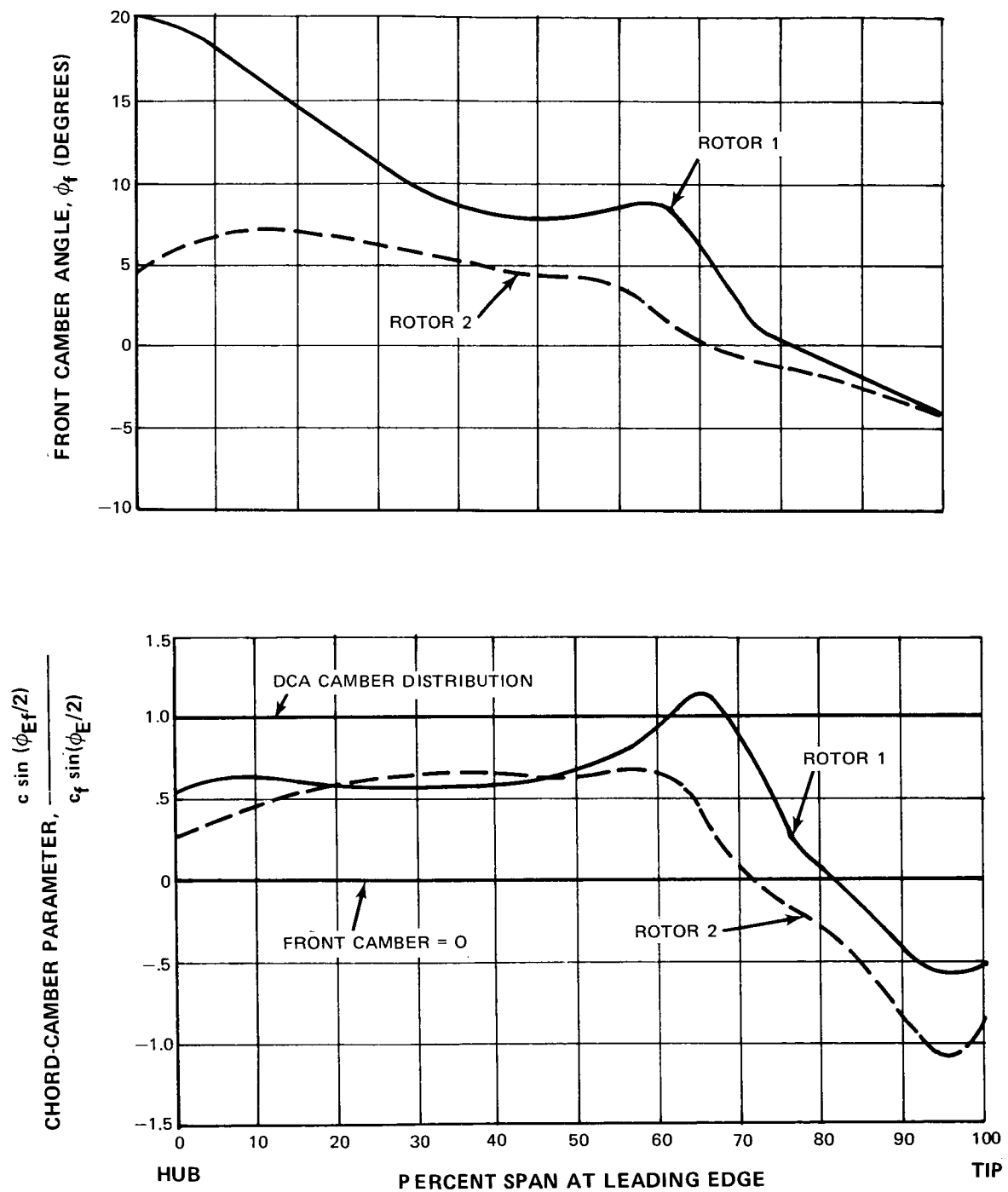
Figure 23   Rotor Front Camber Angle and Chord-Camber Parameter Spanwise Profiles
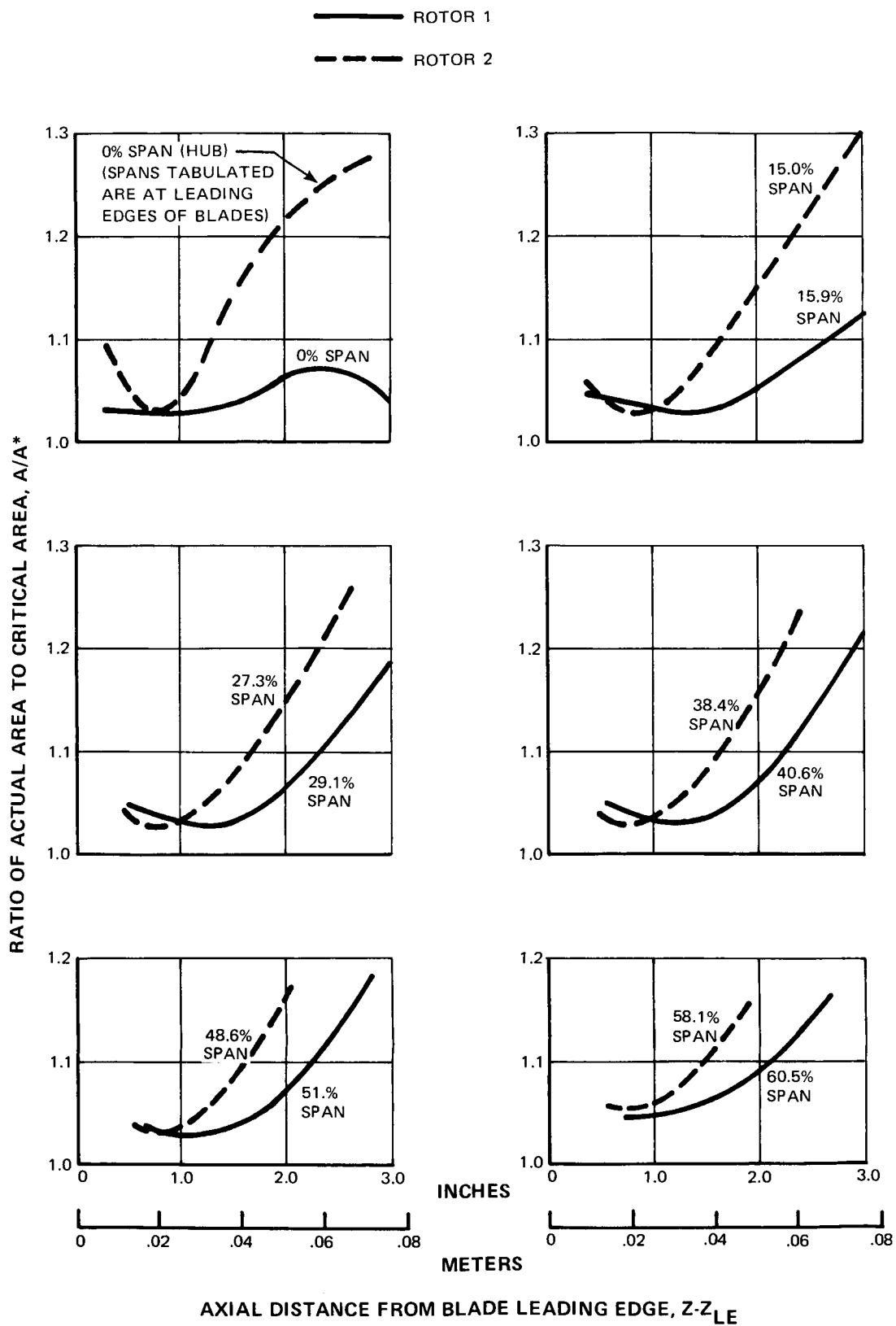
ROTOR 1

ROTOR 2

Figure 24   Rotor Channel Area Ratios Versus Axial Distance

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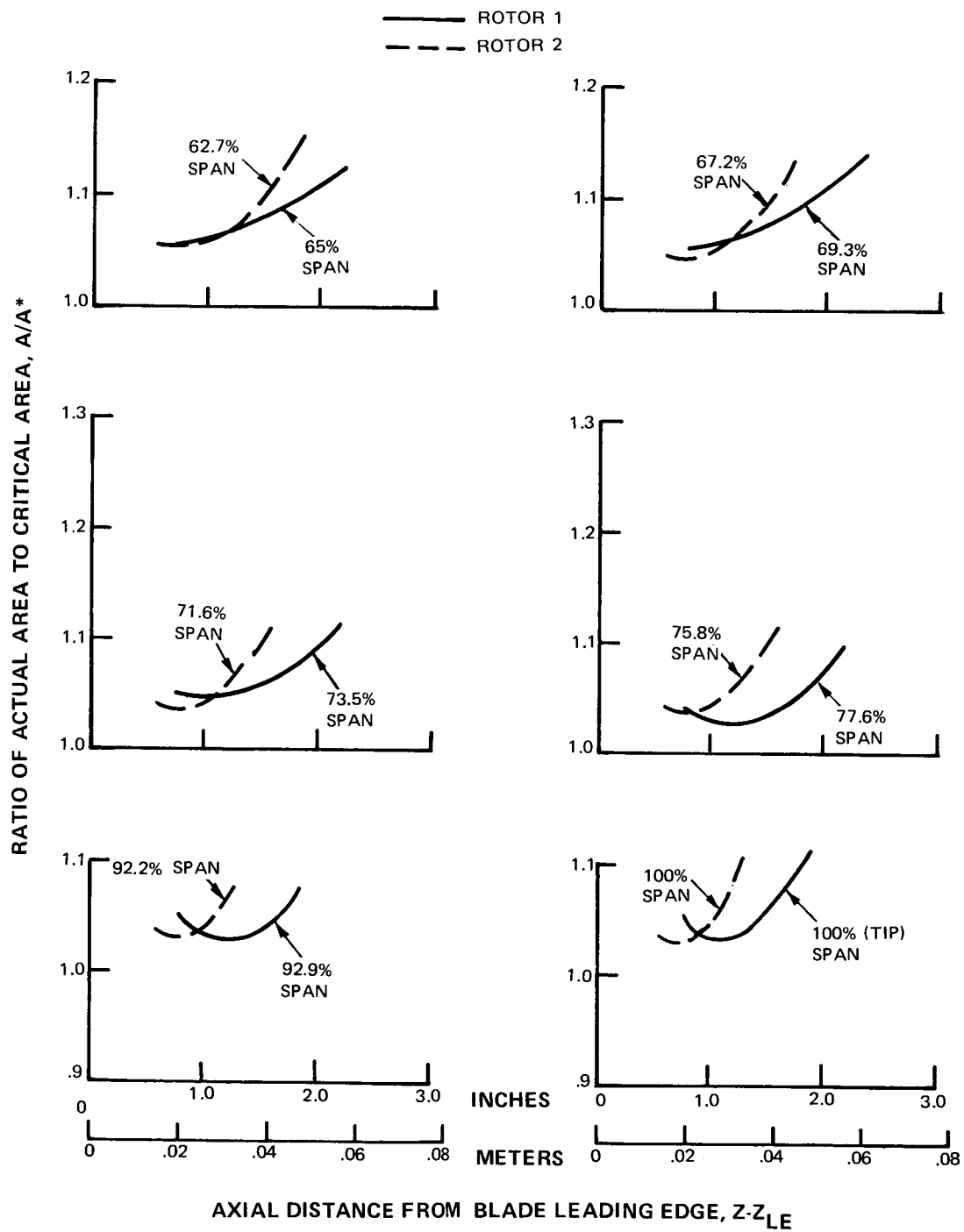
Figure 24 (Cont'd)   Rotor Channel Area Ratios Versus Axial Distance
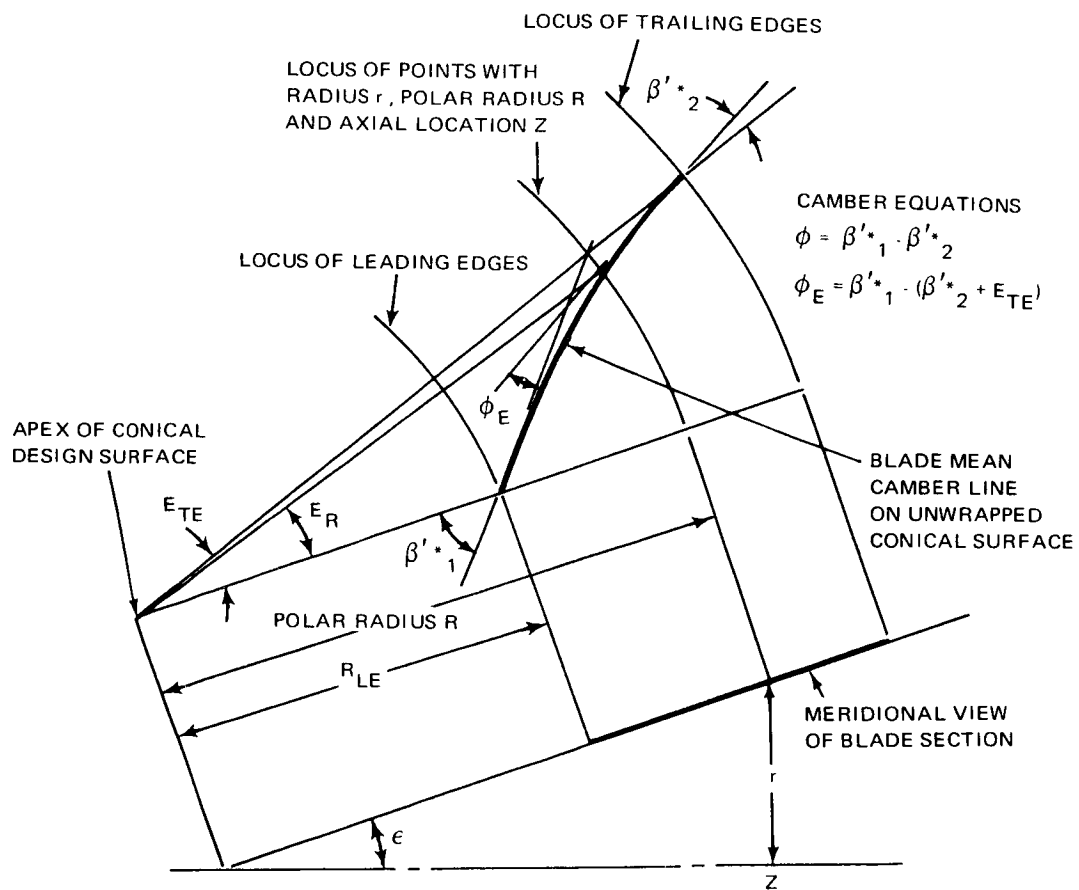
Figure 25   Meridional View and Polar Representation of Blade Mean-Camber-Line
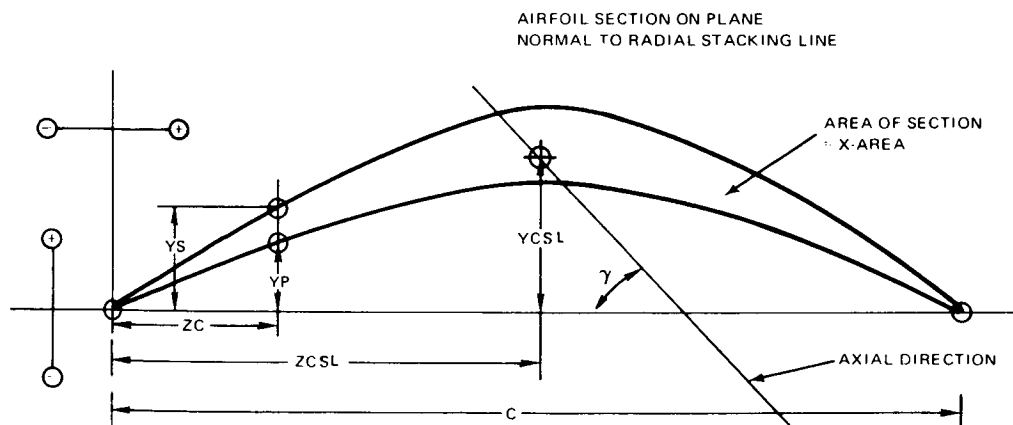
Figure 26   Airfoil Coordinate Definition for Manufacturing Sections

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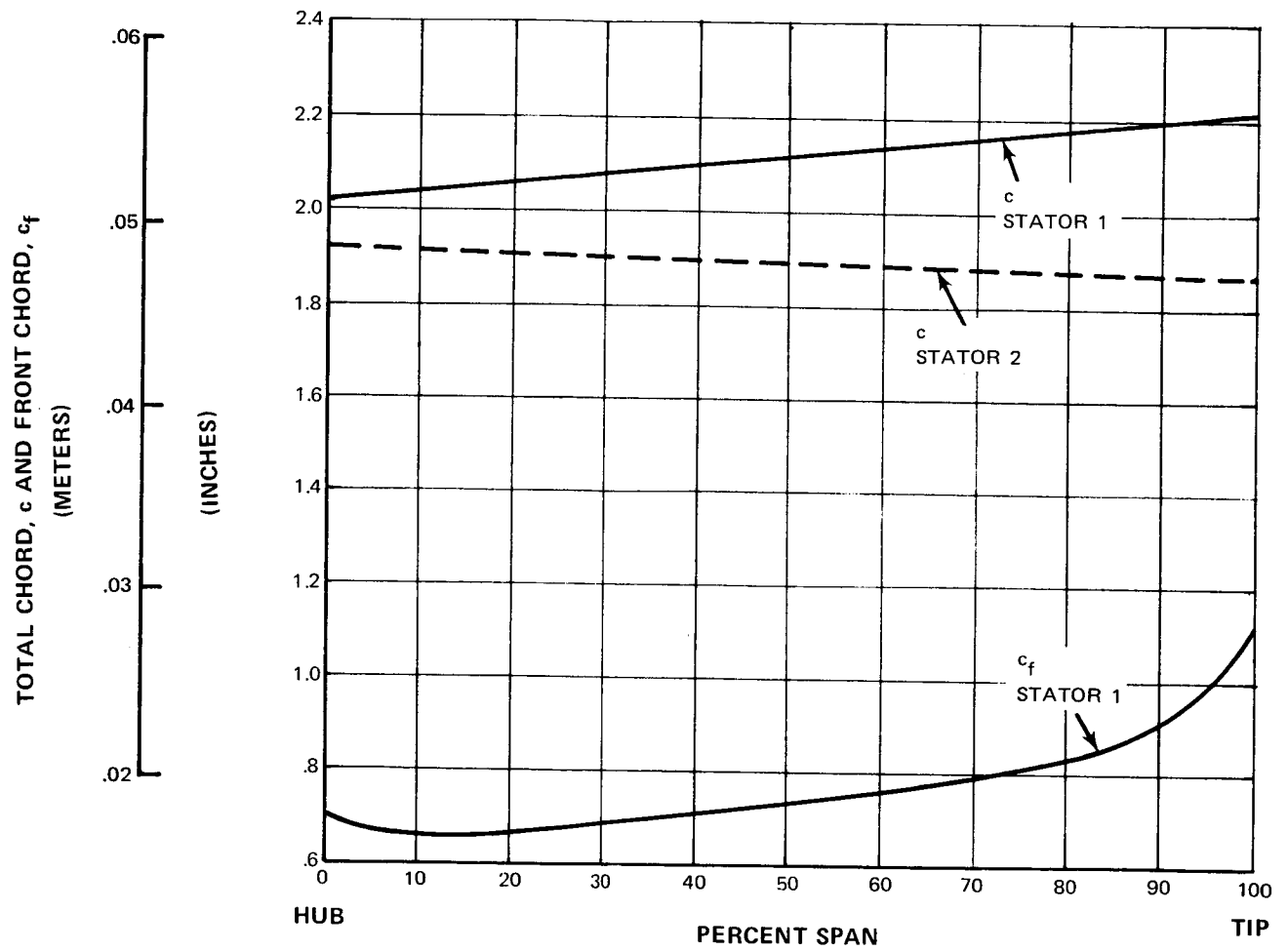
Figure 27   Stator Chord Spanwise Profiles
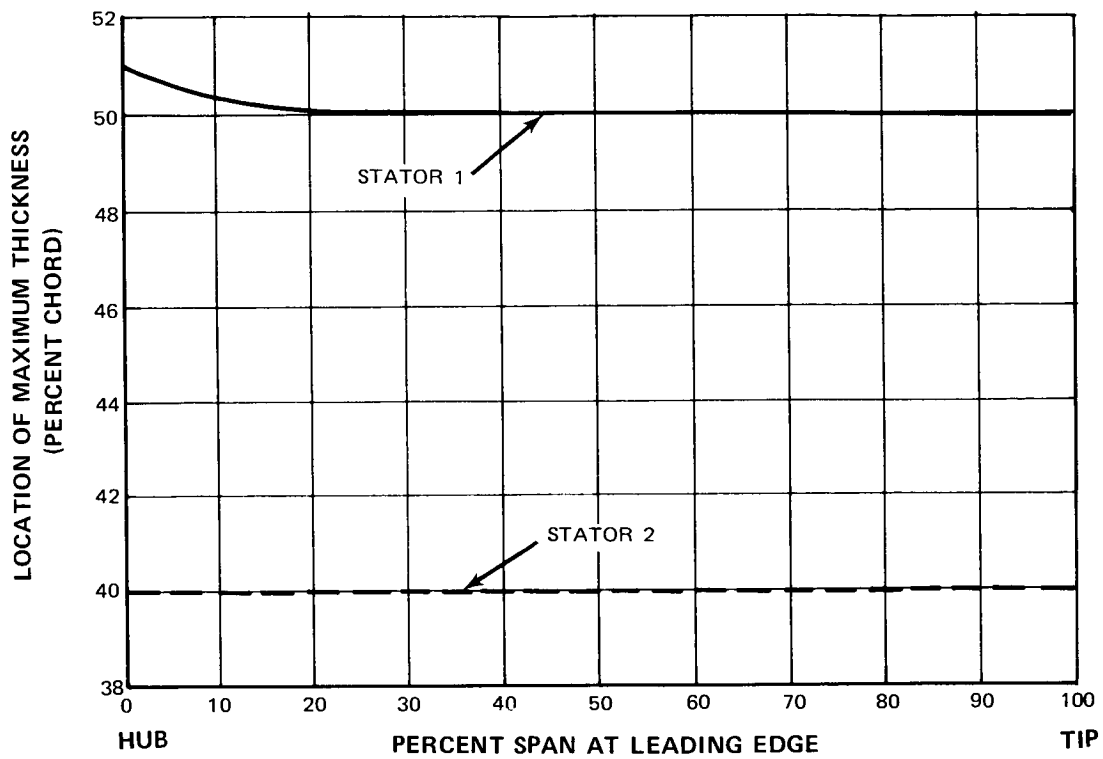
Figure 28   Stator Chordwise Location of Maximum Thickness Spanwise Profiles
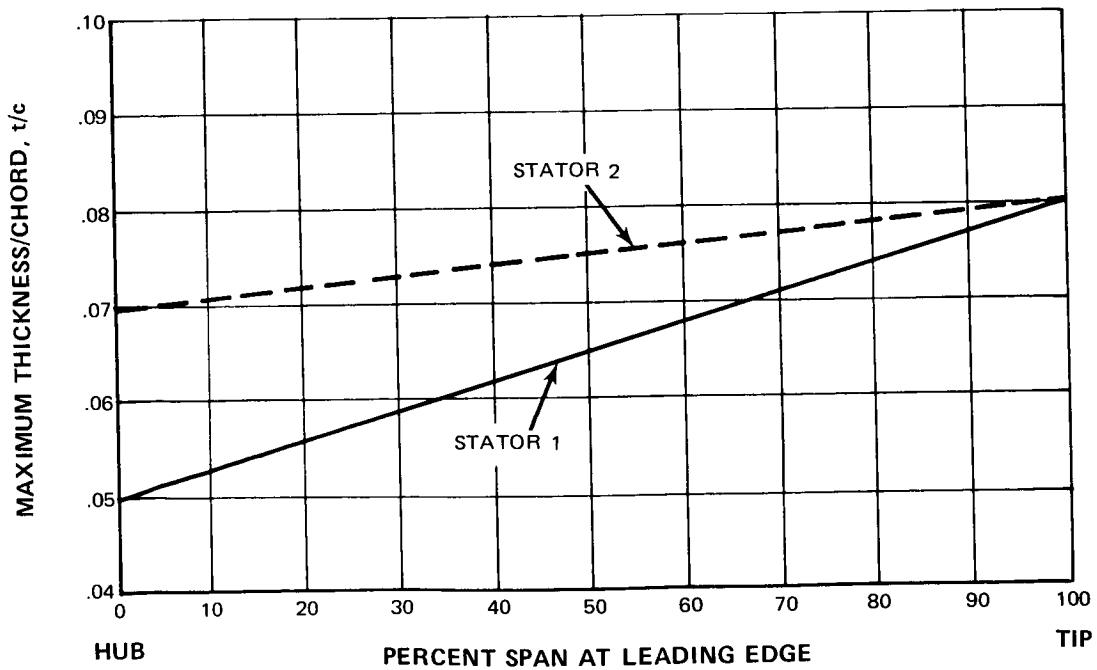
Figure 29   Stator Airfoil Thickness Spanwise Profiles
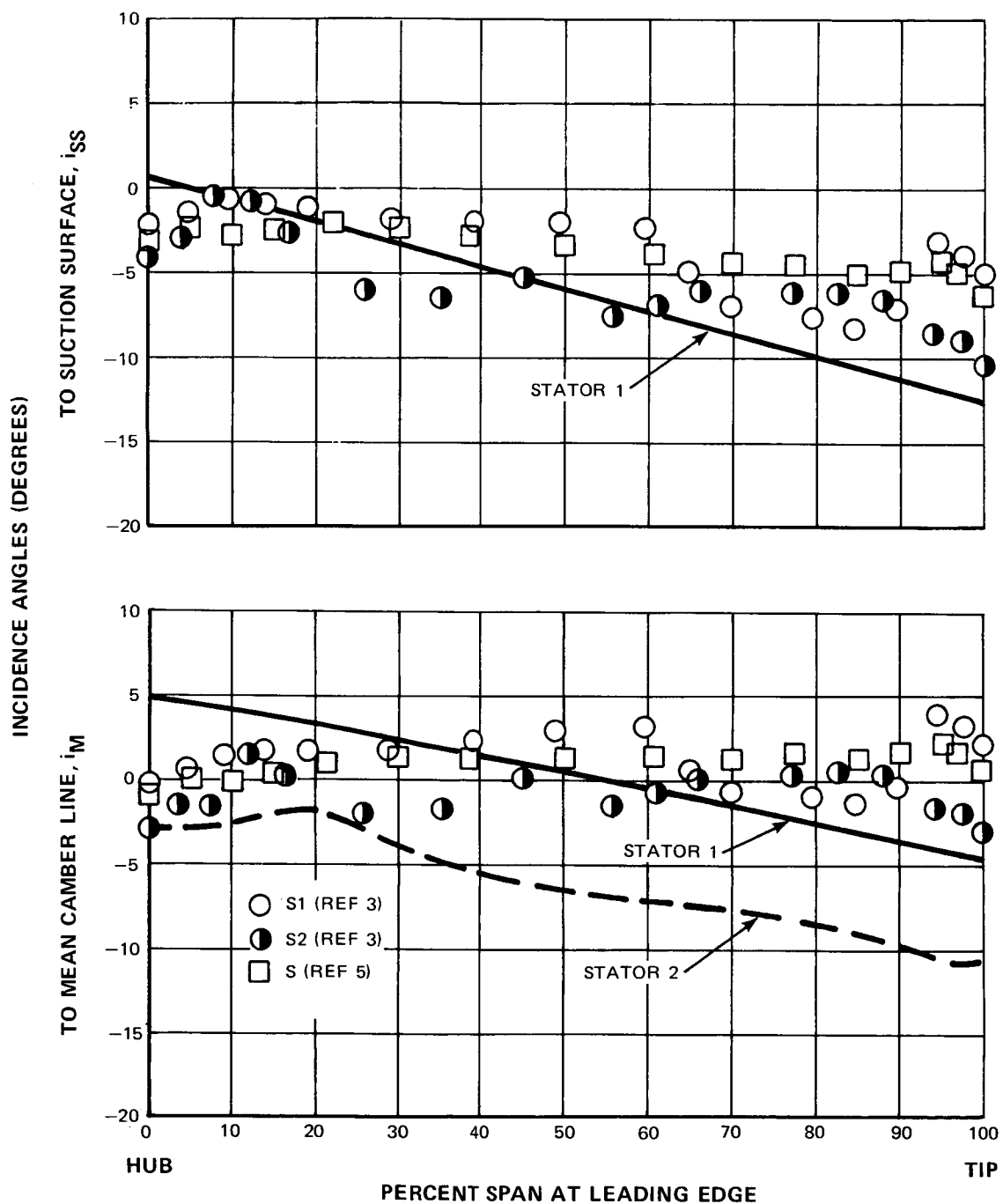
Figure 30   Stator Incidence Angle Spanwise Profiles
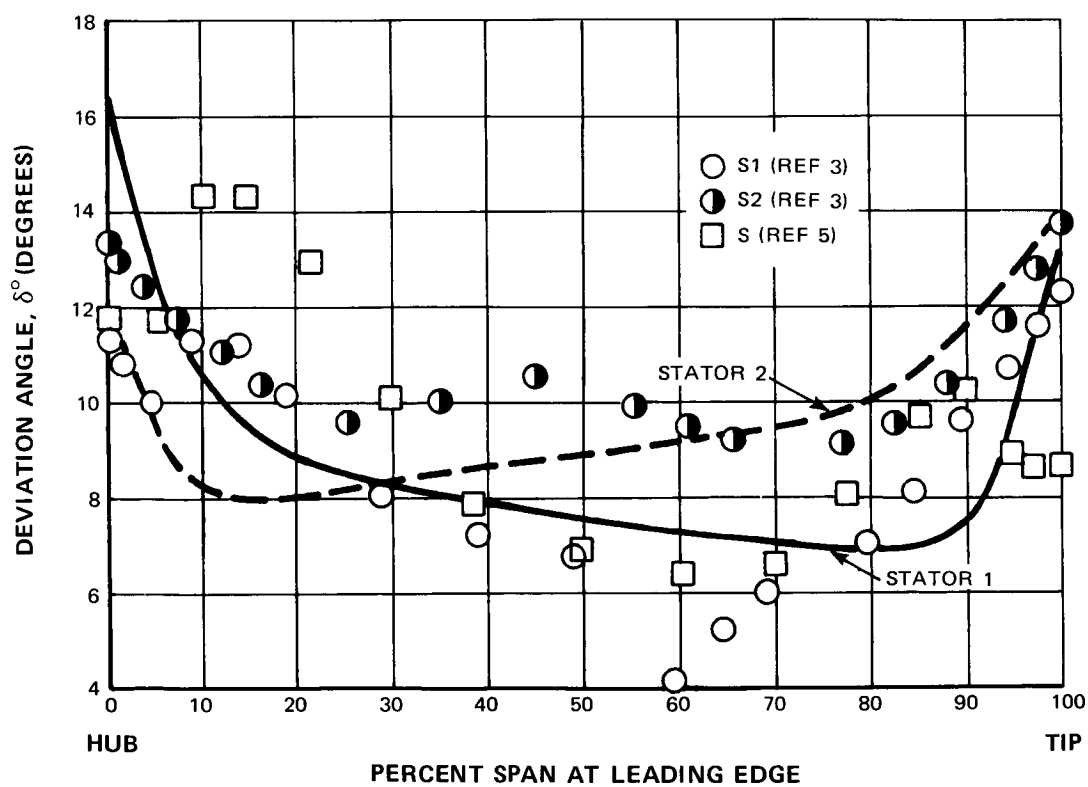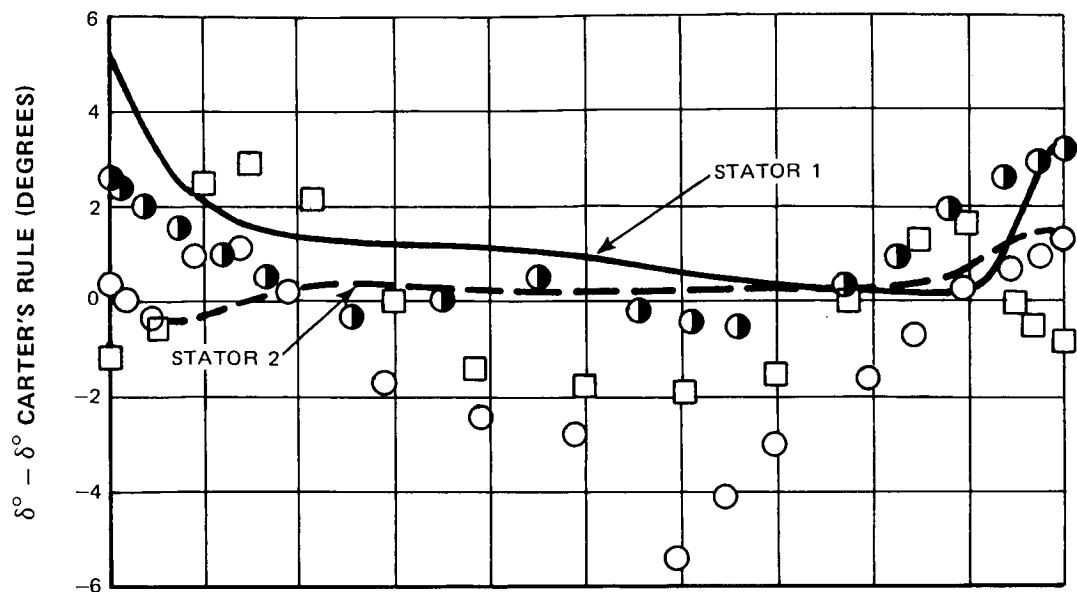
Figure 31   Stator Deviation Angle Spanwise Profiles
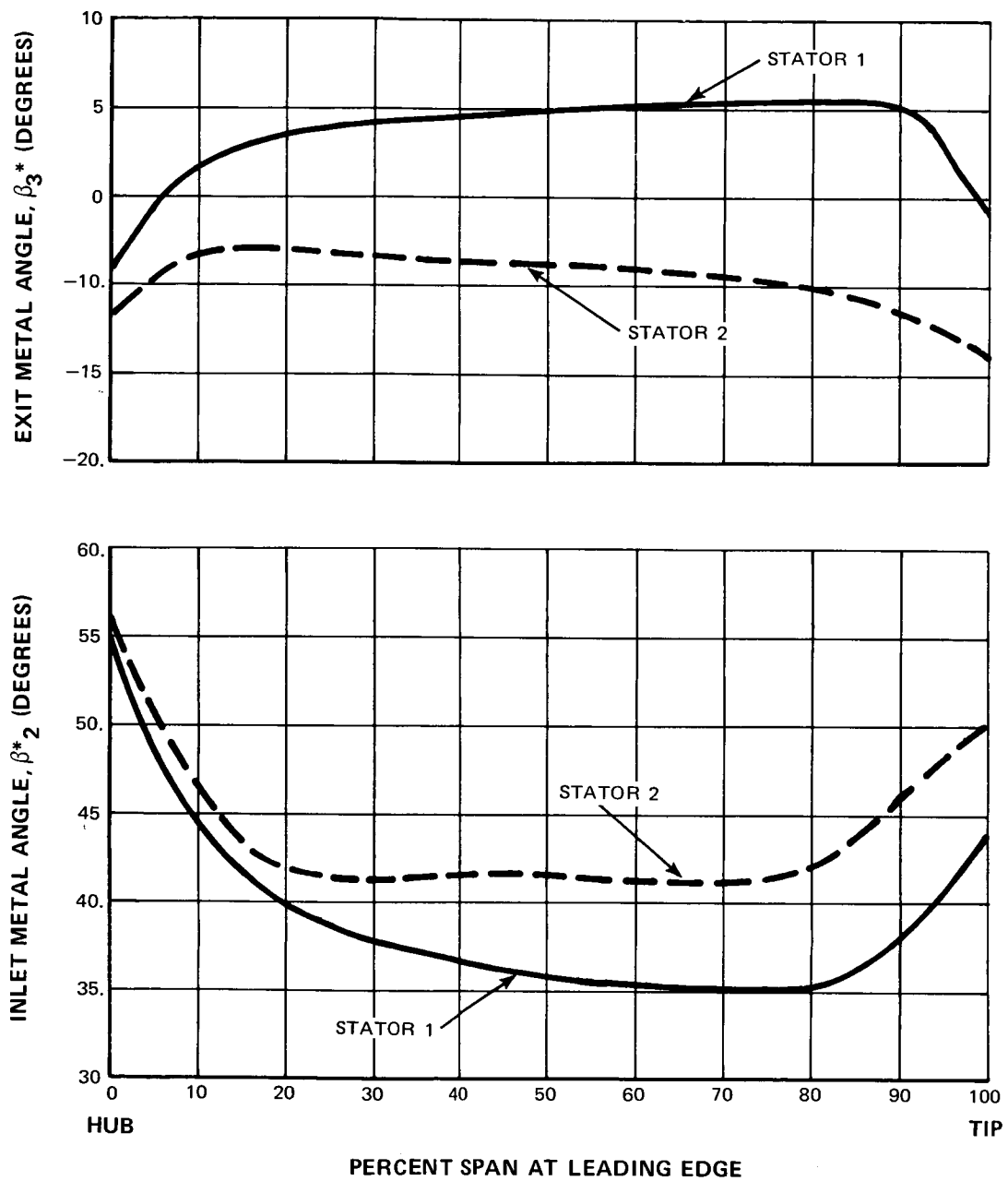
Figure 32   Stator Inlet and Exit Metal Angle Spanwise Profiles
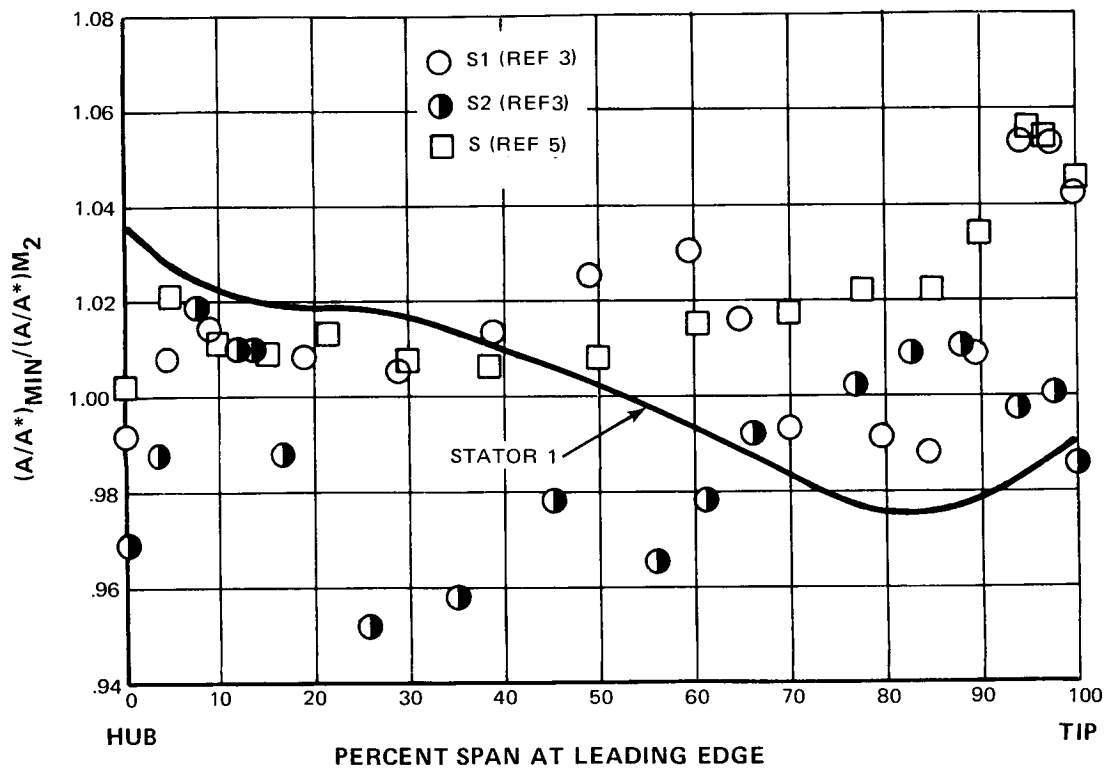
Figure 33   Ratios of Channel-Throat-Area to Captured-Area Versus Span for Stators
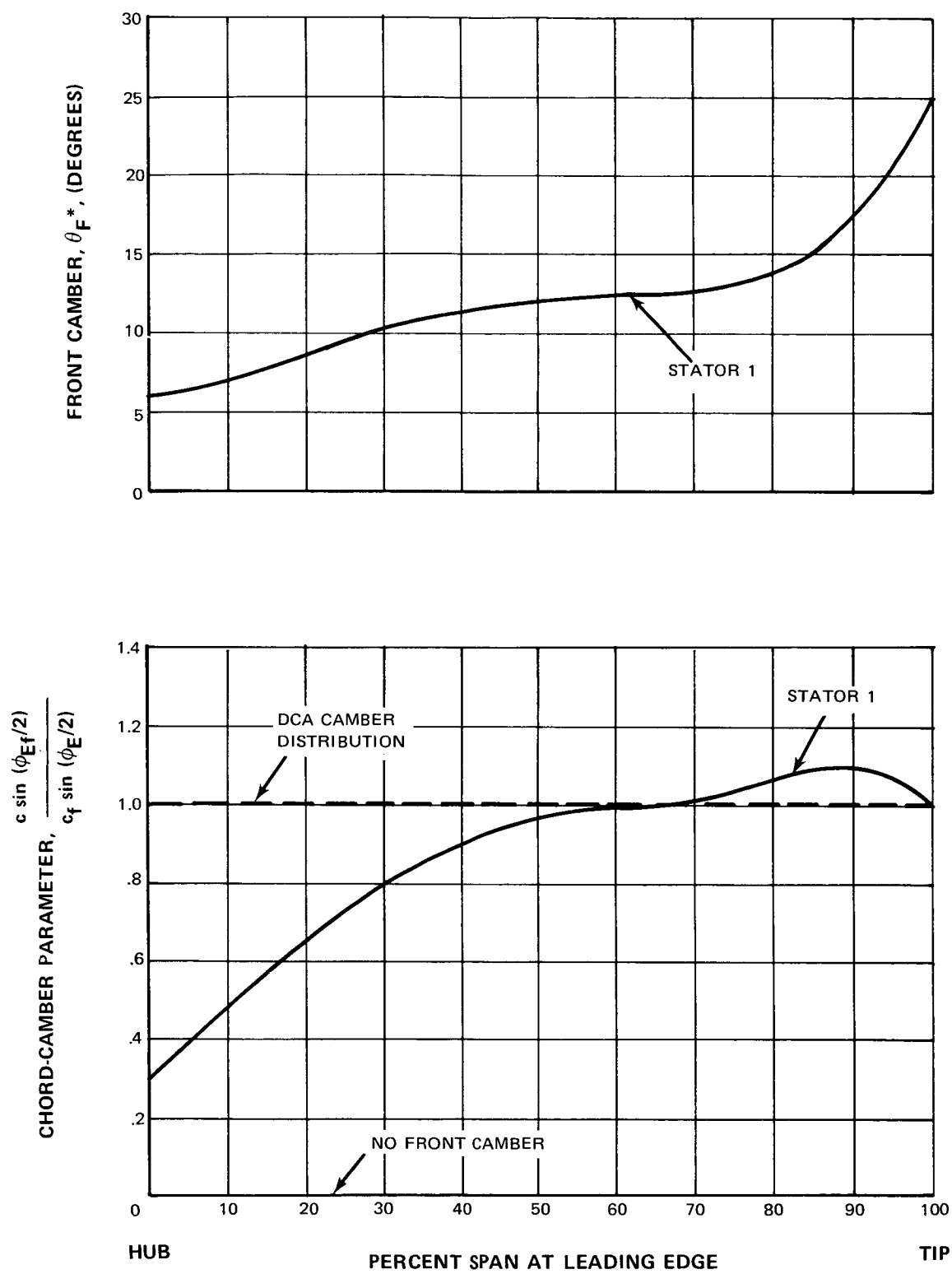
Figure 34   Stator 1 Front Camber Angle and Chord-Camber Parameter Spanwise Profiles
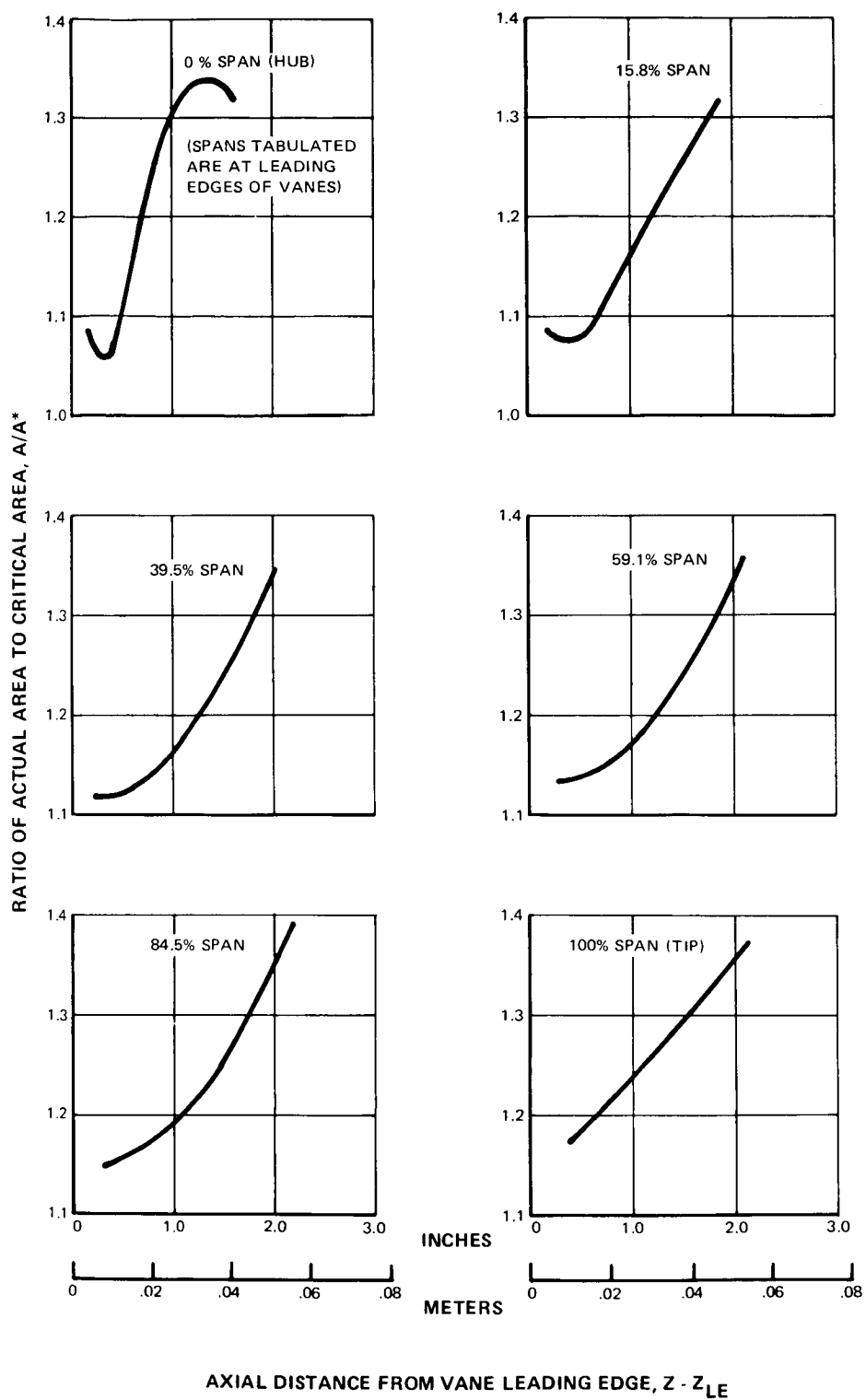
Figure 35   Stator 1 Channel Area Ratios Versus Axial Distance
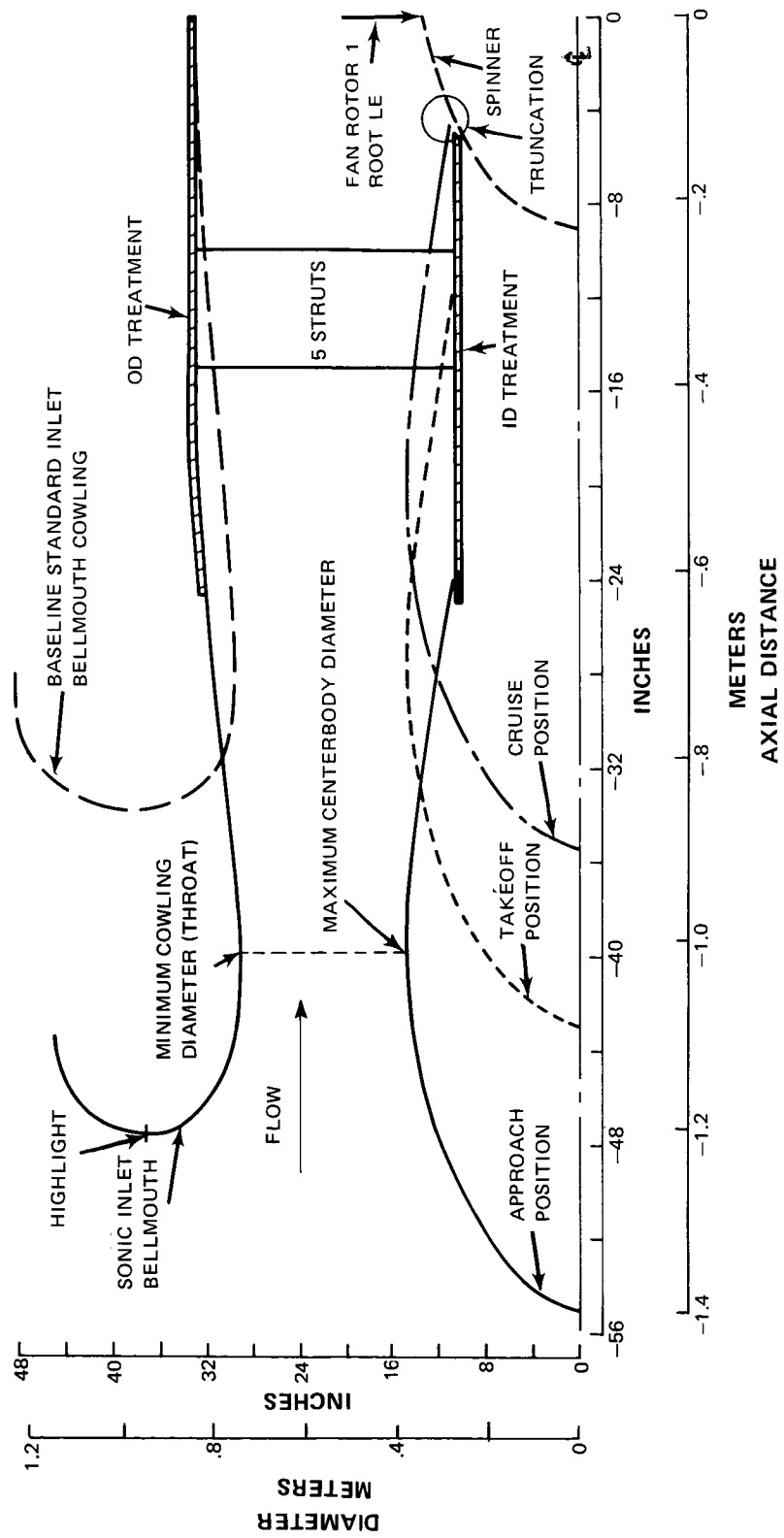
Figure 36   Baseline Standard and Sonic Inlet Geometries

55
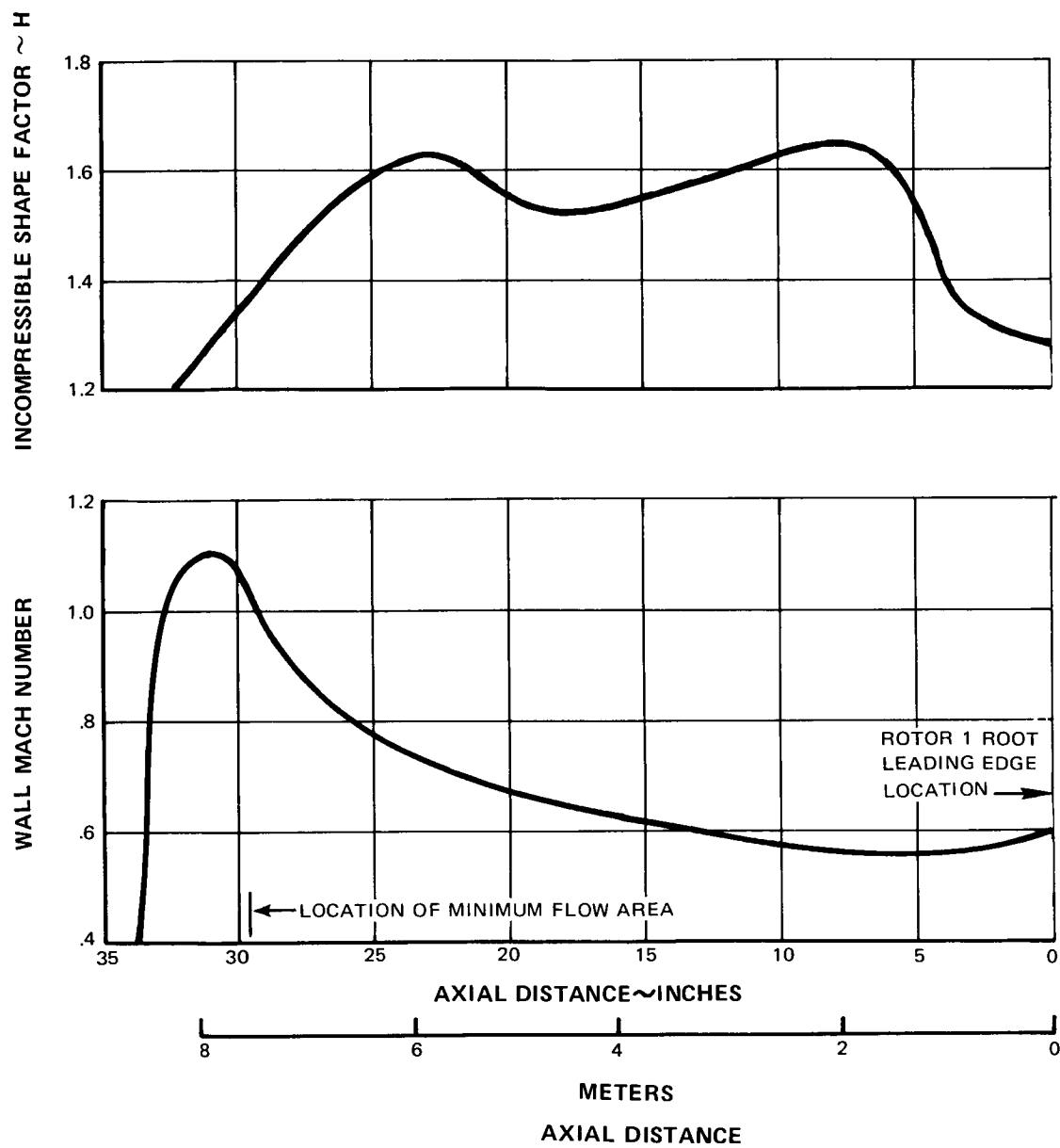
Figure 37   Baseline Standard Inlet Outer Wall Mach Number and Shape Factor Distributions
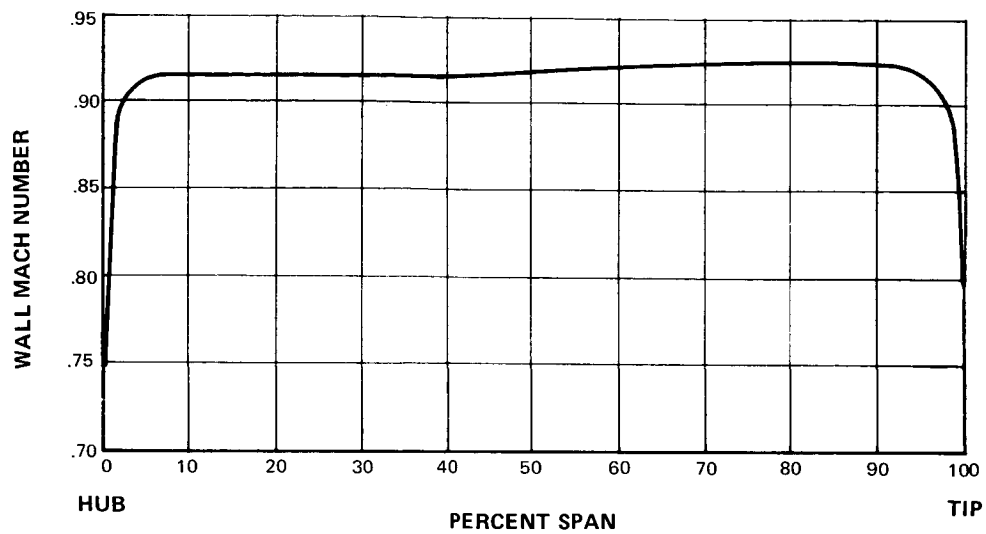
Figure 38   Sonic Inlet Throat Mach Number Spanwise Profile — Approach Configuration
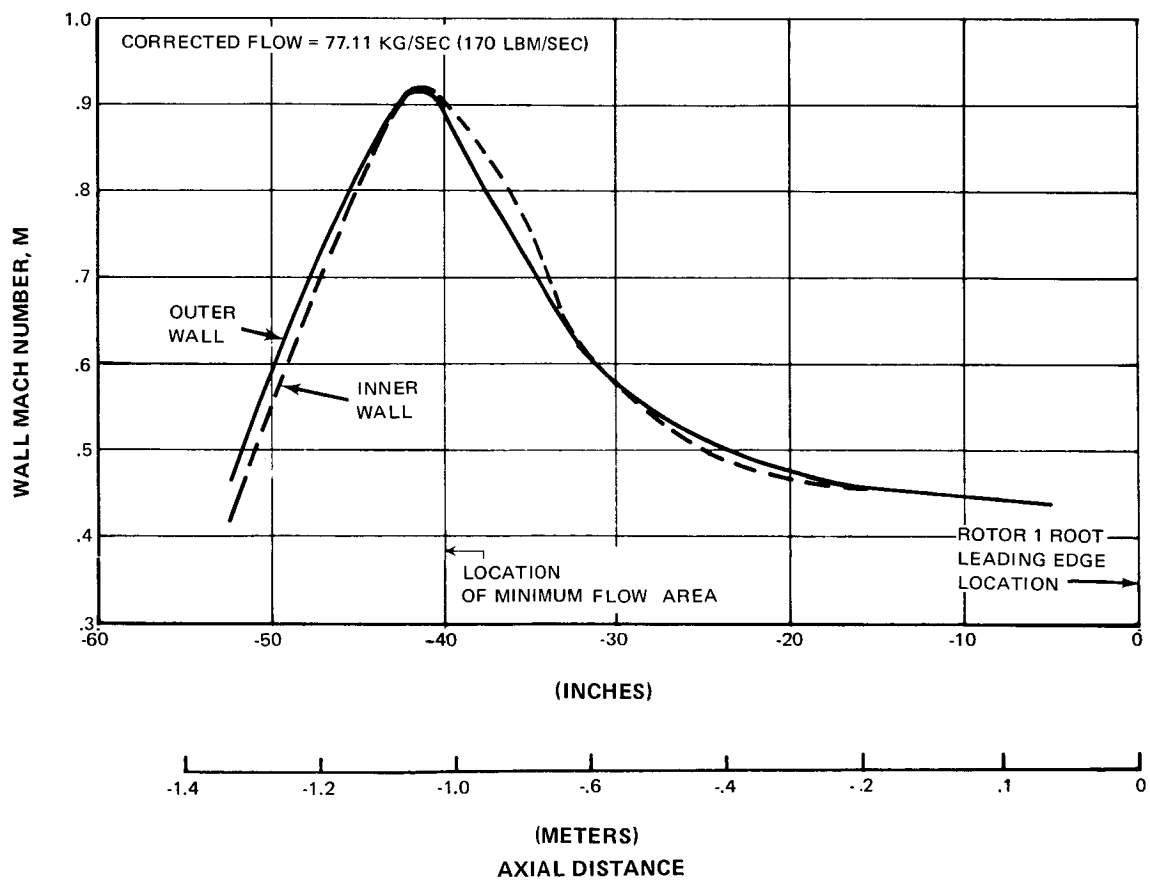
Figure 39   Mach Number Distributions Along Inlet Walls — Approach Configuration

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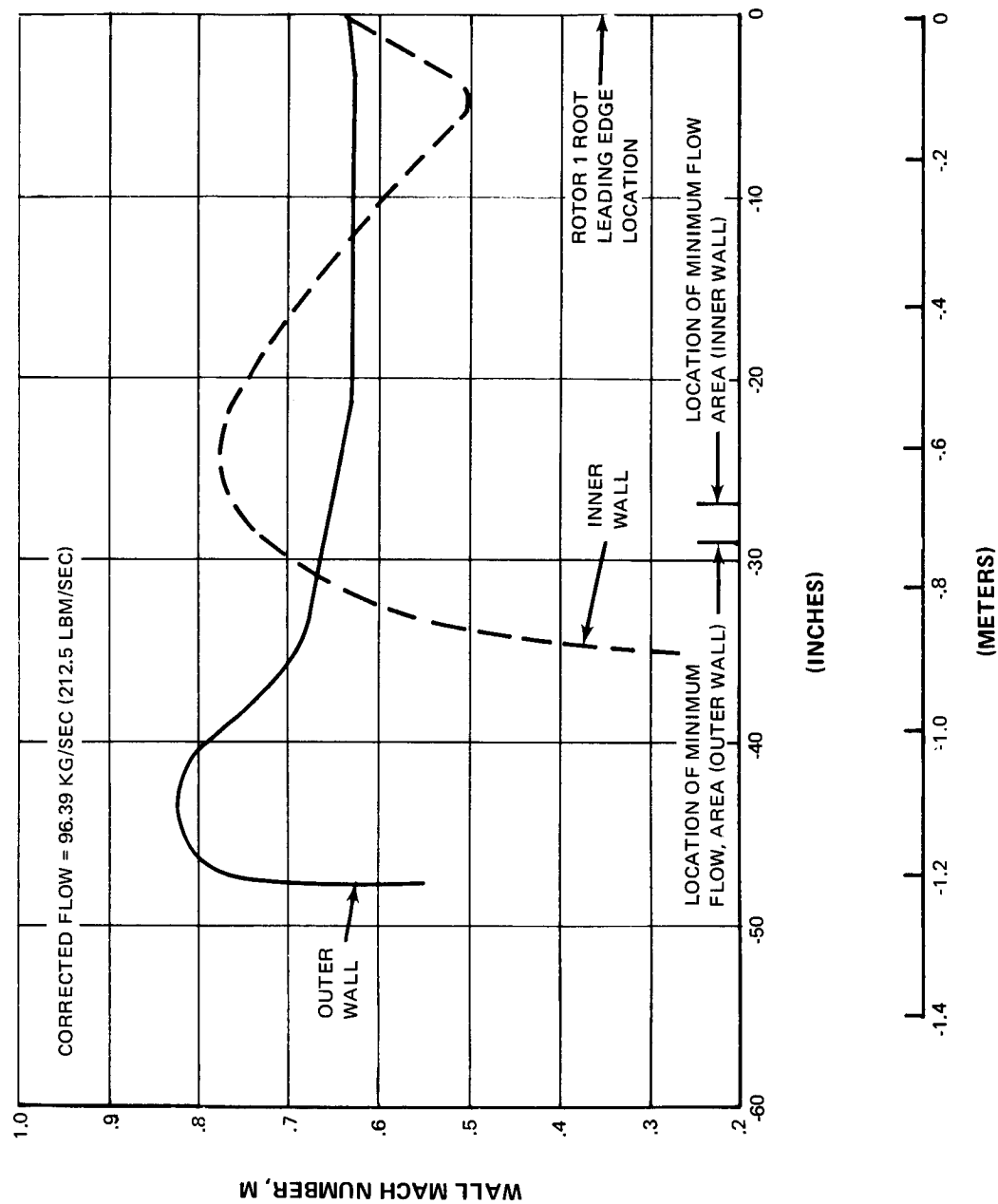
Figure 40   Mach Number Distributions Along Inlet Walls — Cruise Configuration

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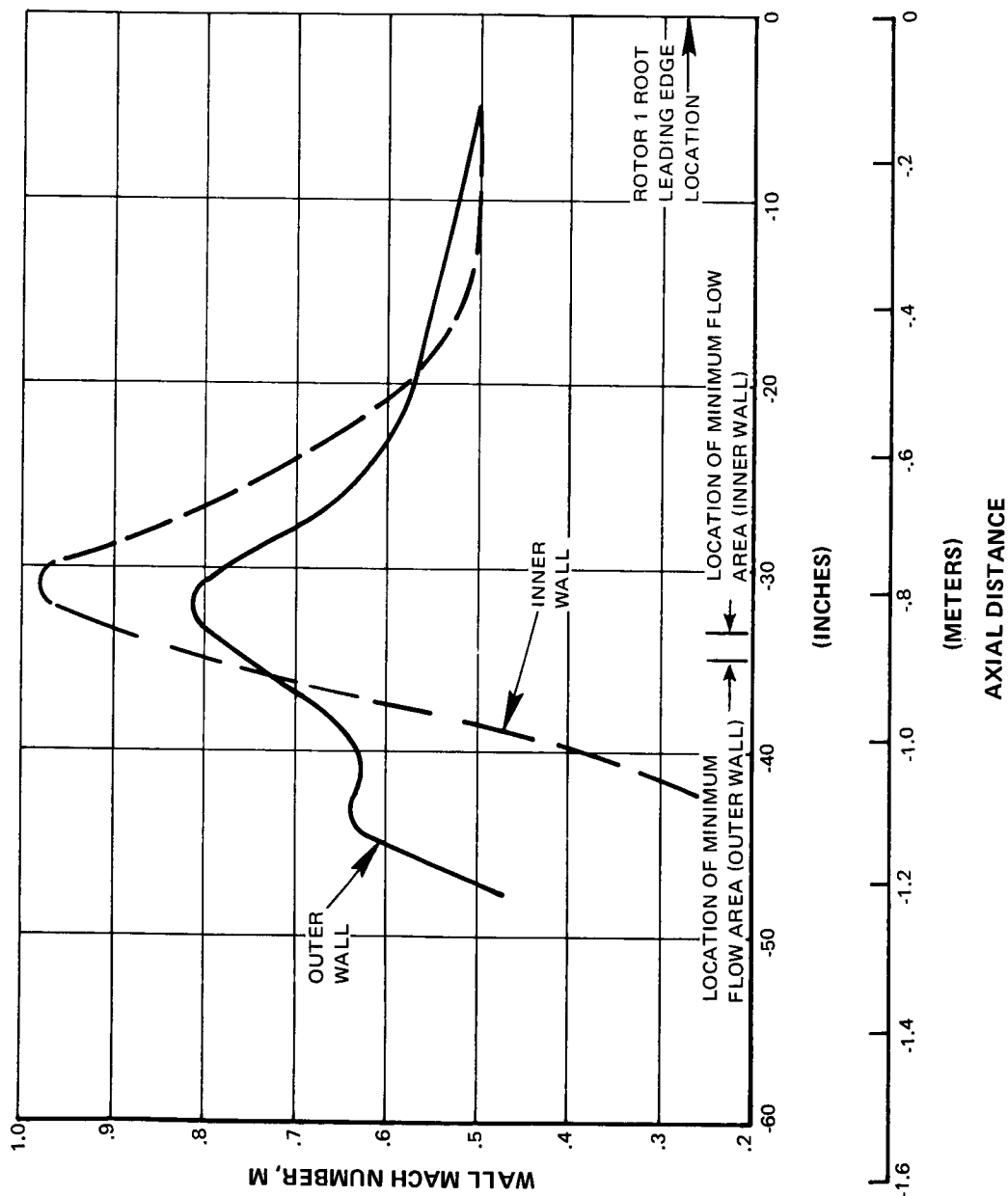
Figure 41   Mach Number Distributions Along Inlet Walls — Takeoff Configuration
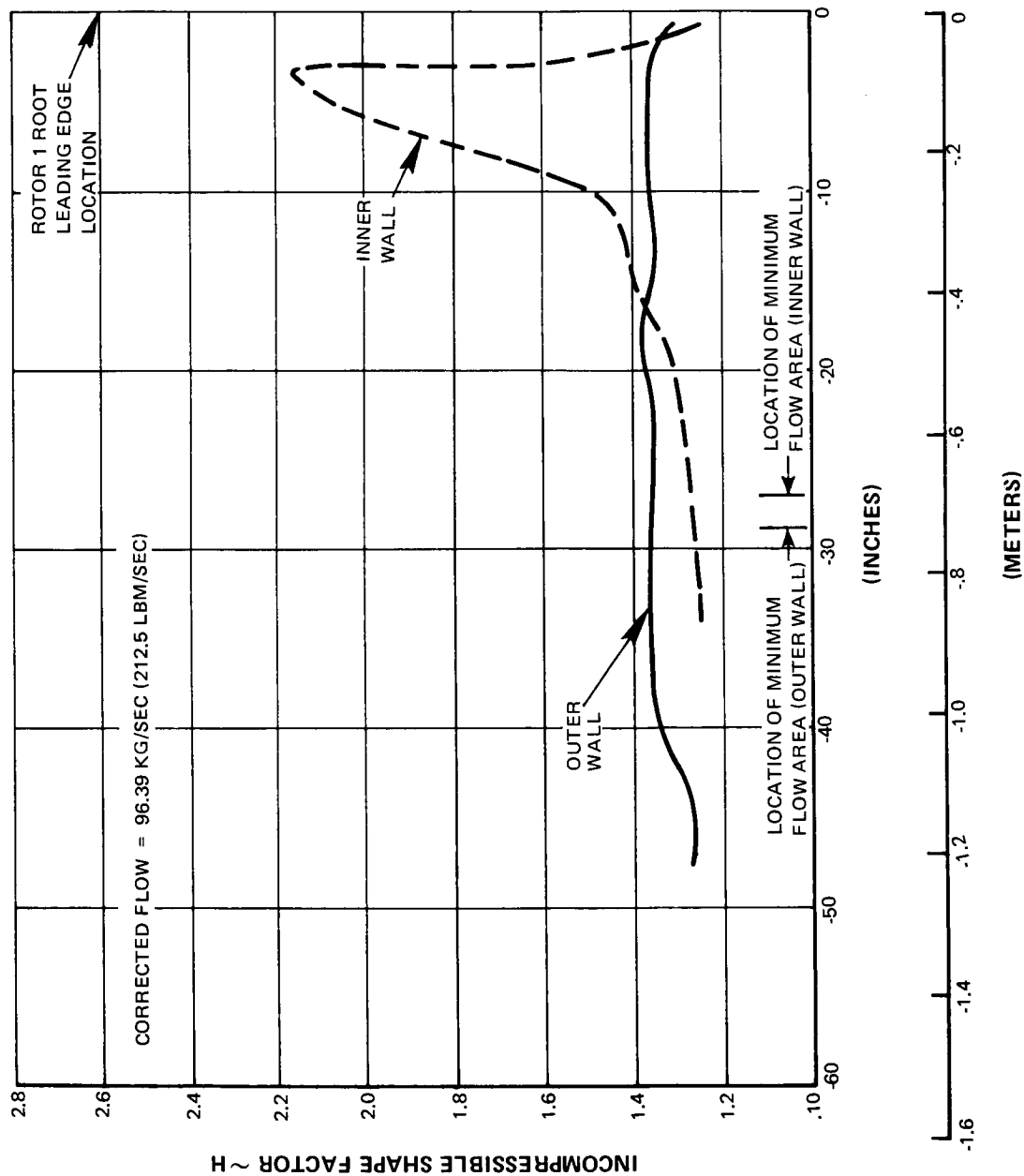
Figure 42   Boundary Layer Shape Factor Distributions Along Inlet Walls — Cruise Configuration

60
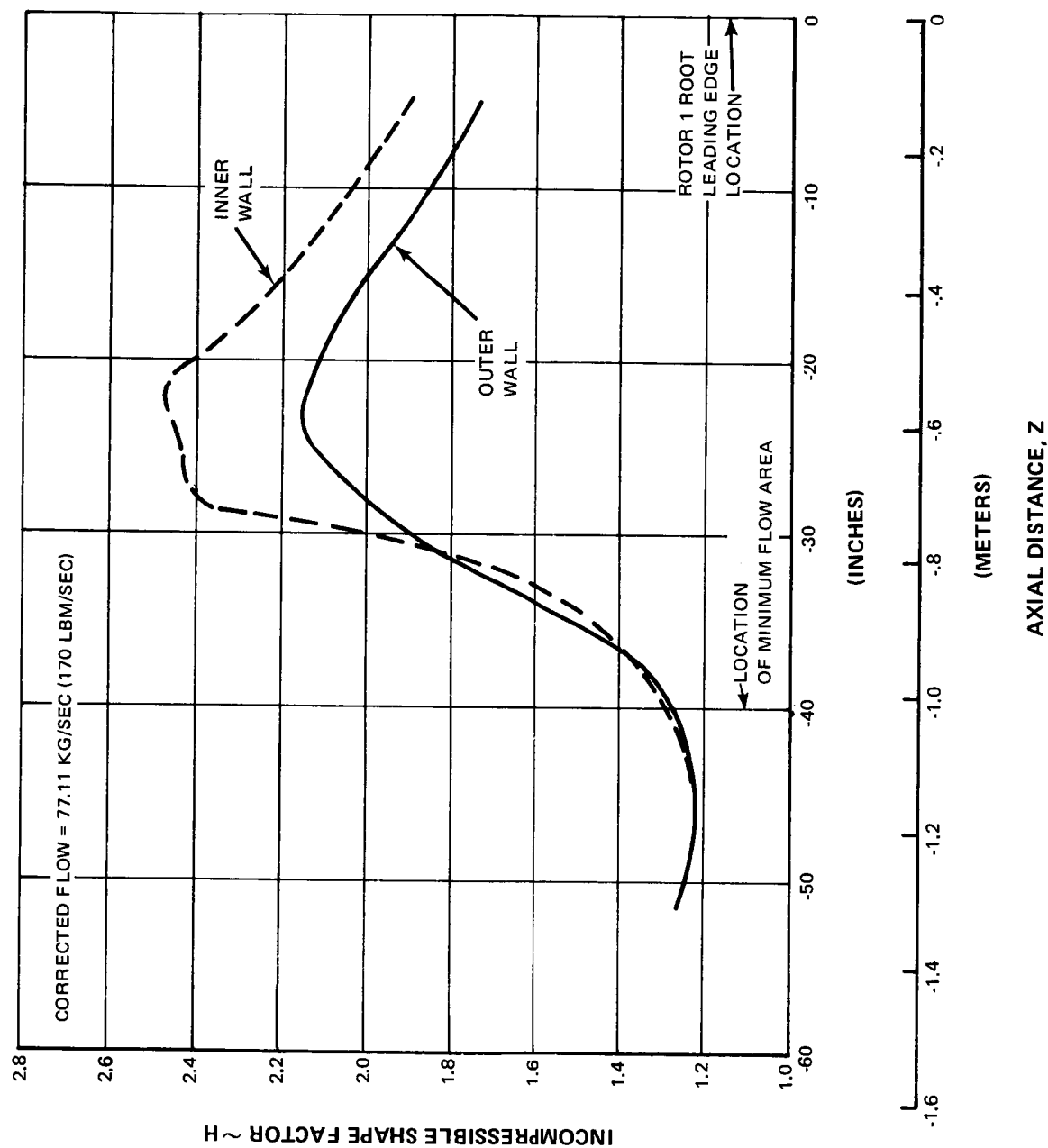
Figure 43   Boundary Layer Shape Factor Distributions Along Inlet Walls — Approach
Configuration
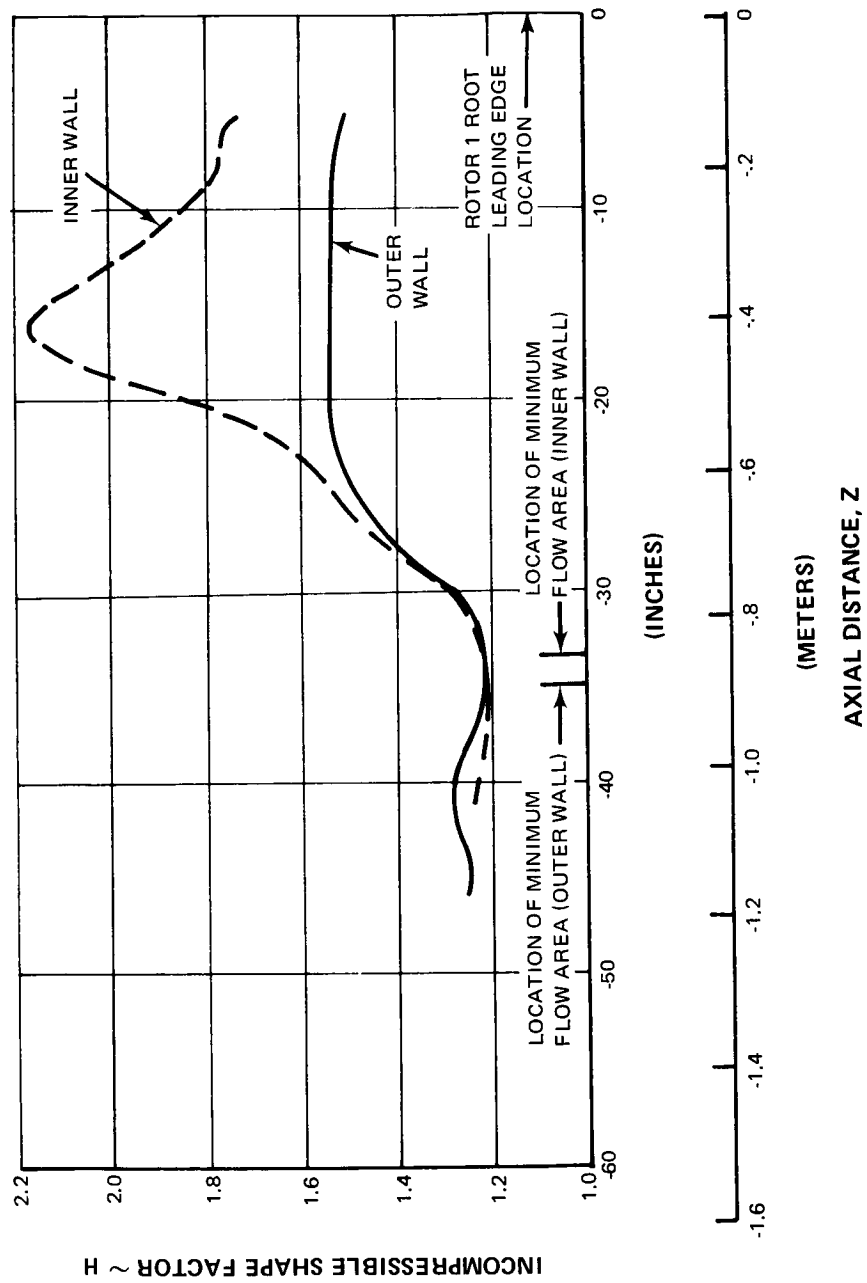
Figure 44   Boundary Layer Shape Factor Distributions Along Inlet Walls — Takeoff
Configuration
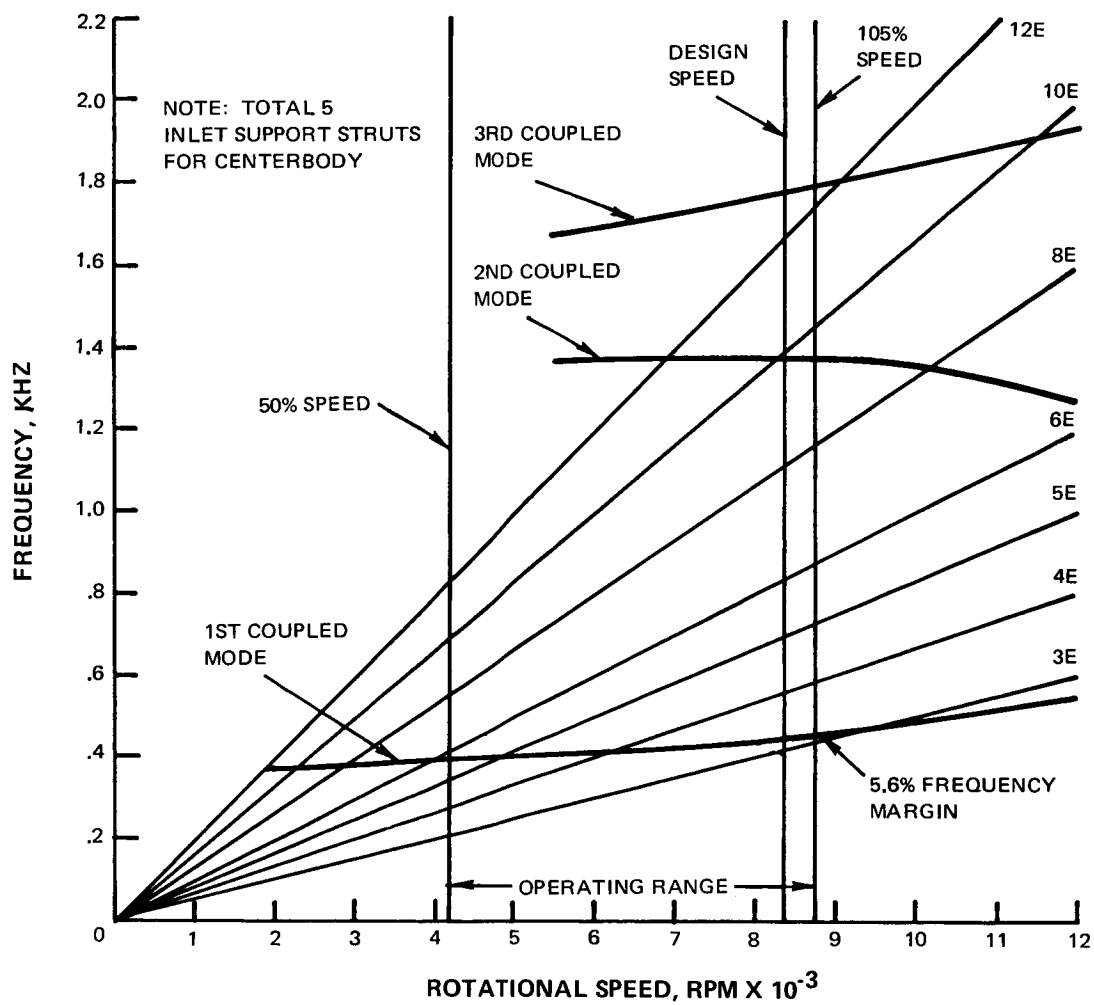
Figure 45   Rotor 1 Campbell Diagram
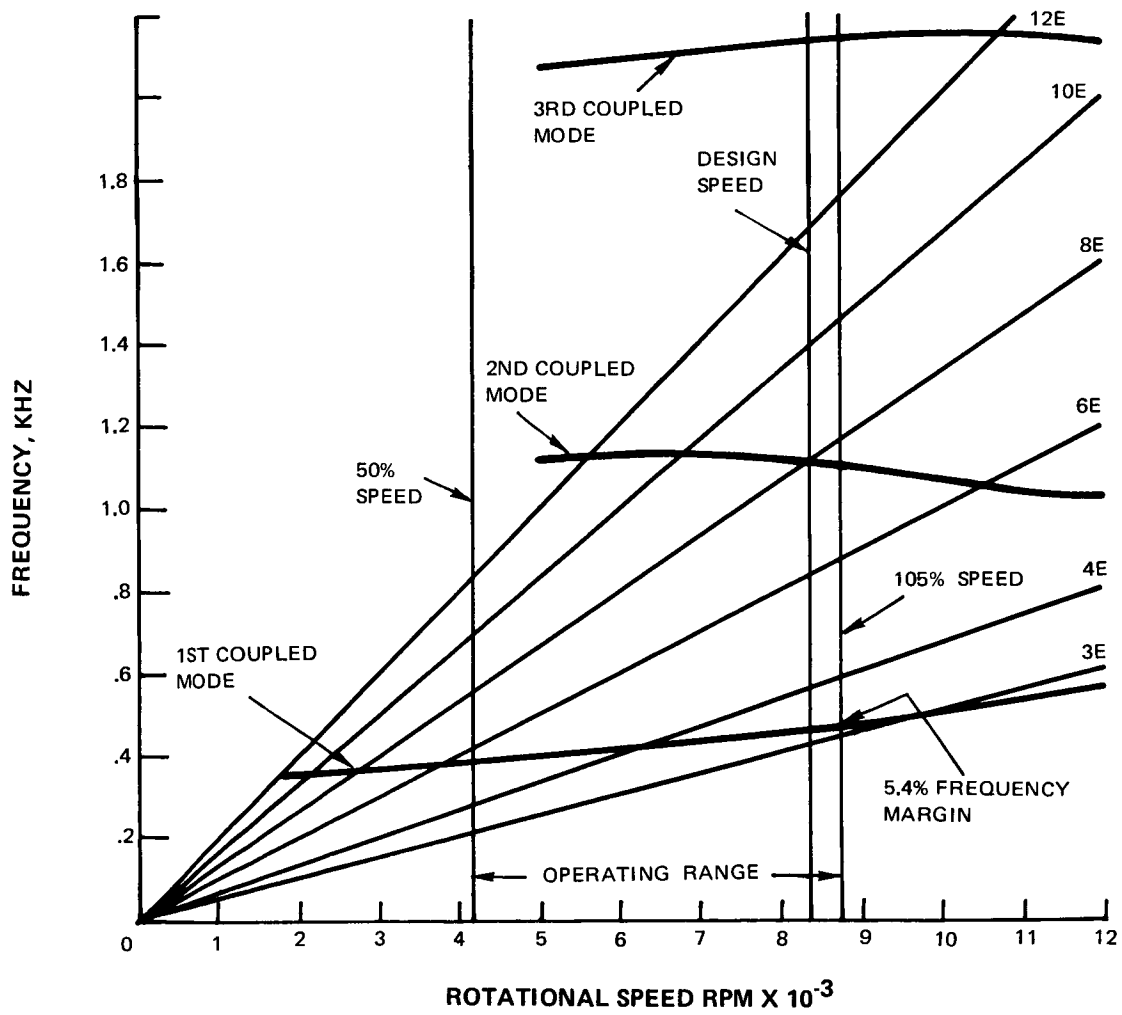
Figure 46   Rotor 2 Campbell Diagram

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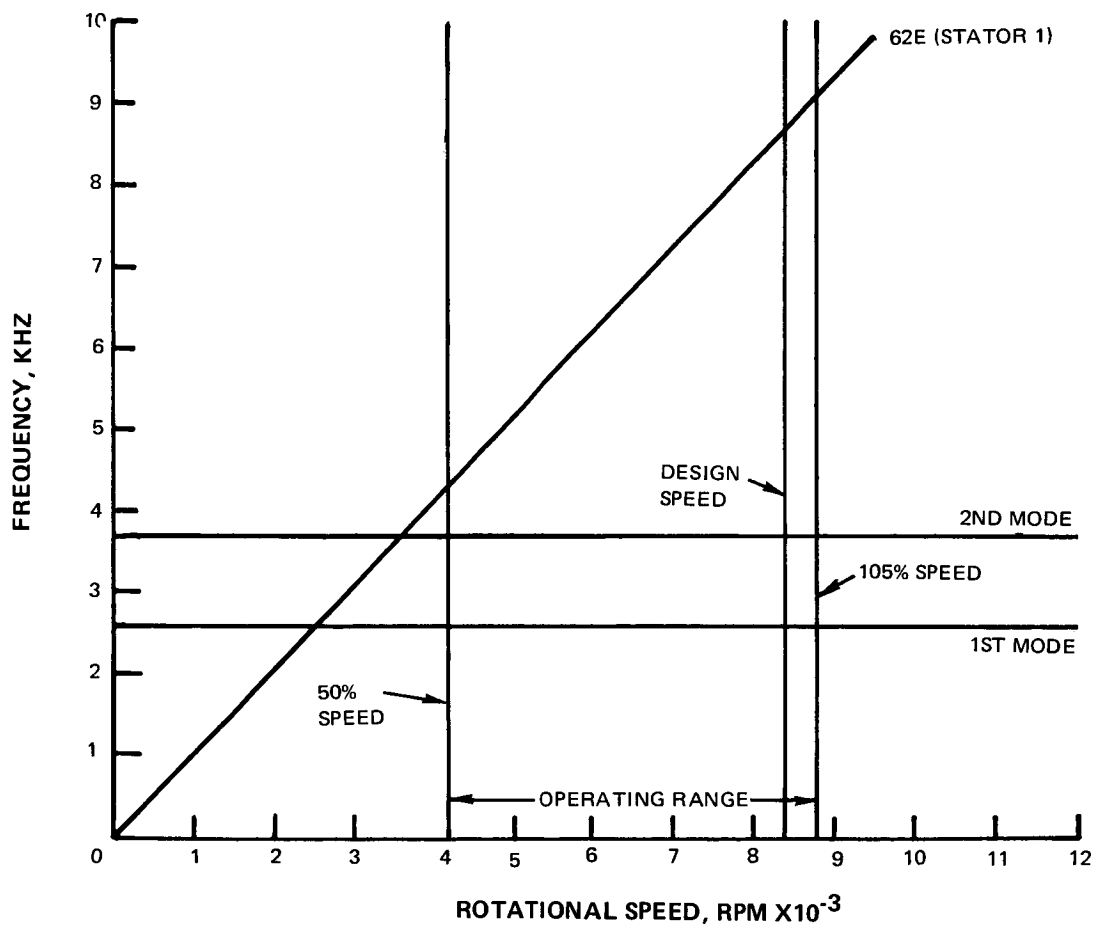
Figure 47   Rotor 1 Tip Mode Campbell Diagram
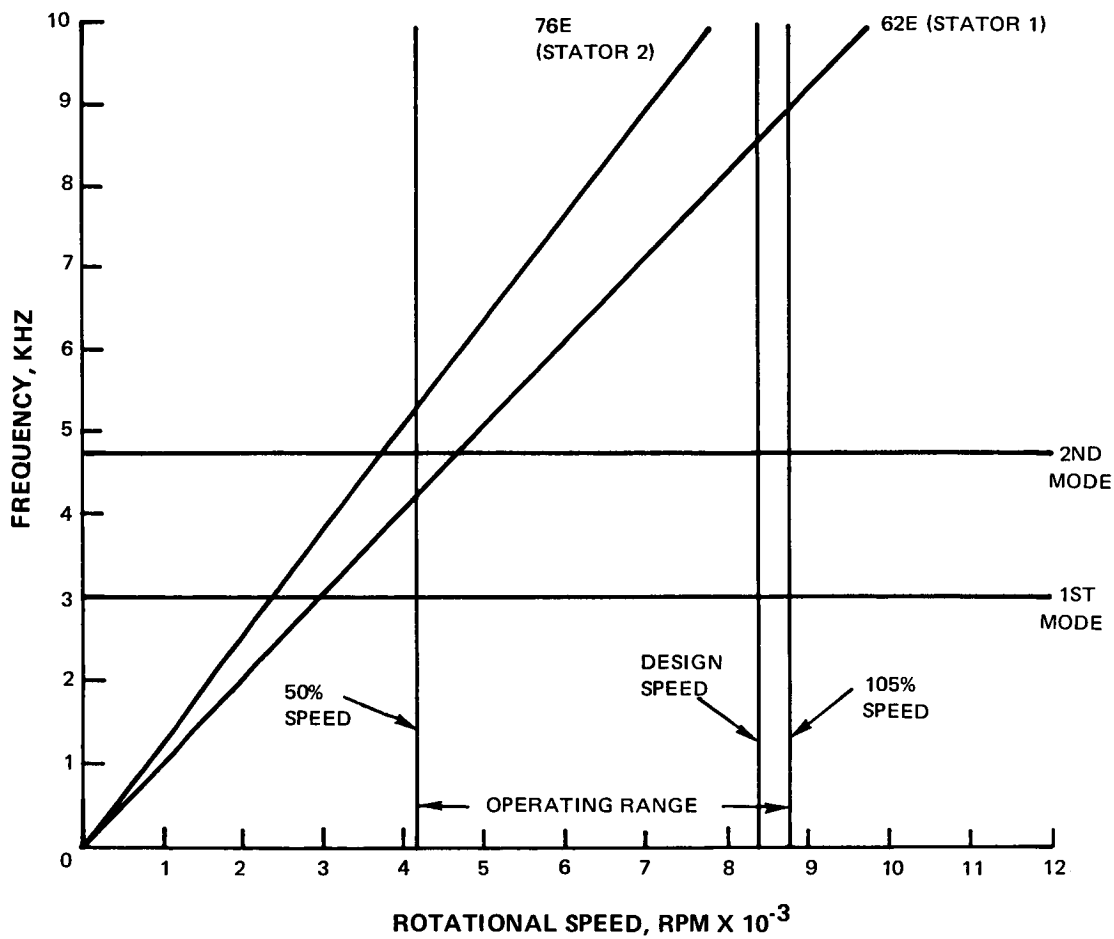
Figure 48   Rotor 2 Tip Mode Campbell Diagram
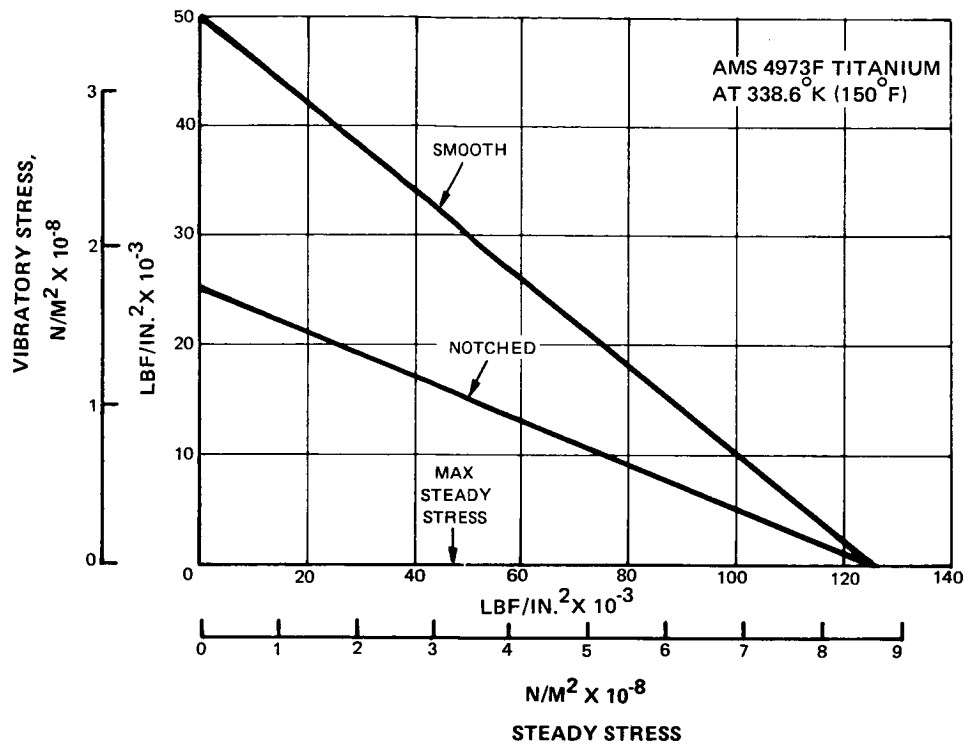
Figure 49   Rotor 1 Goodman Diagram
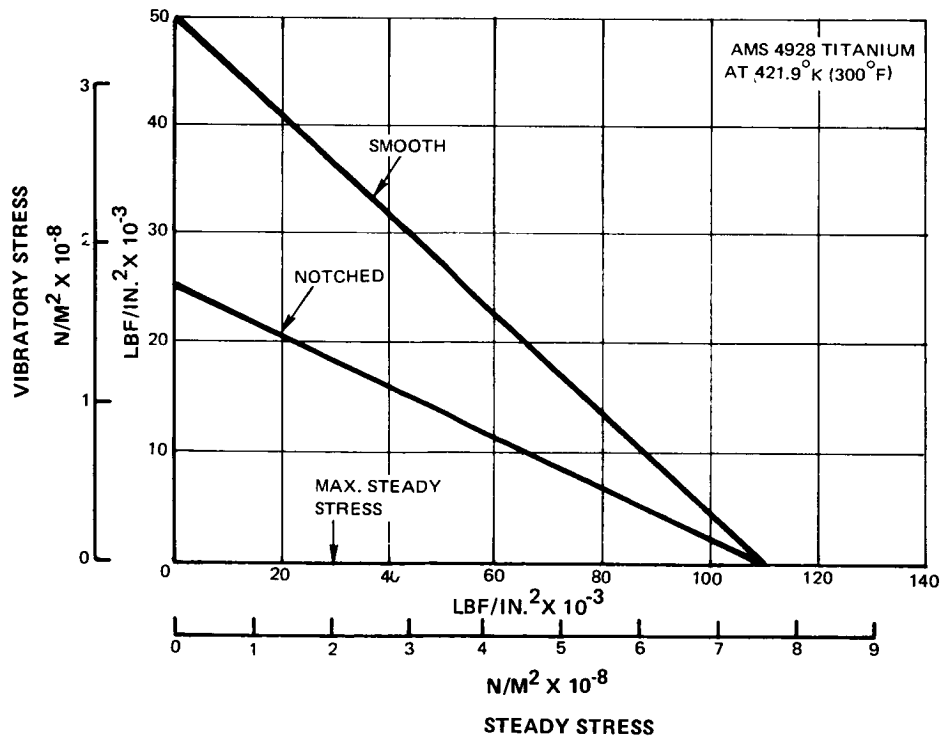
Figure 50   Rotor 2 Goodman Diagram
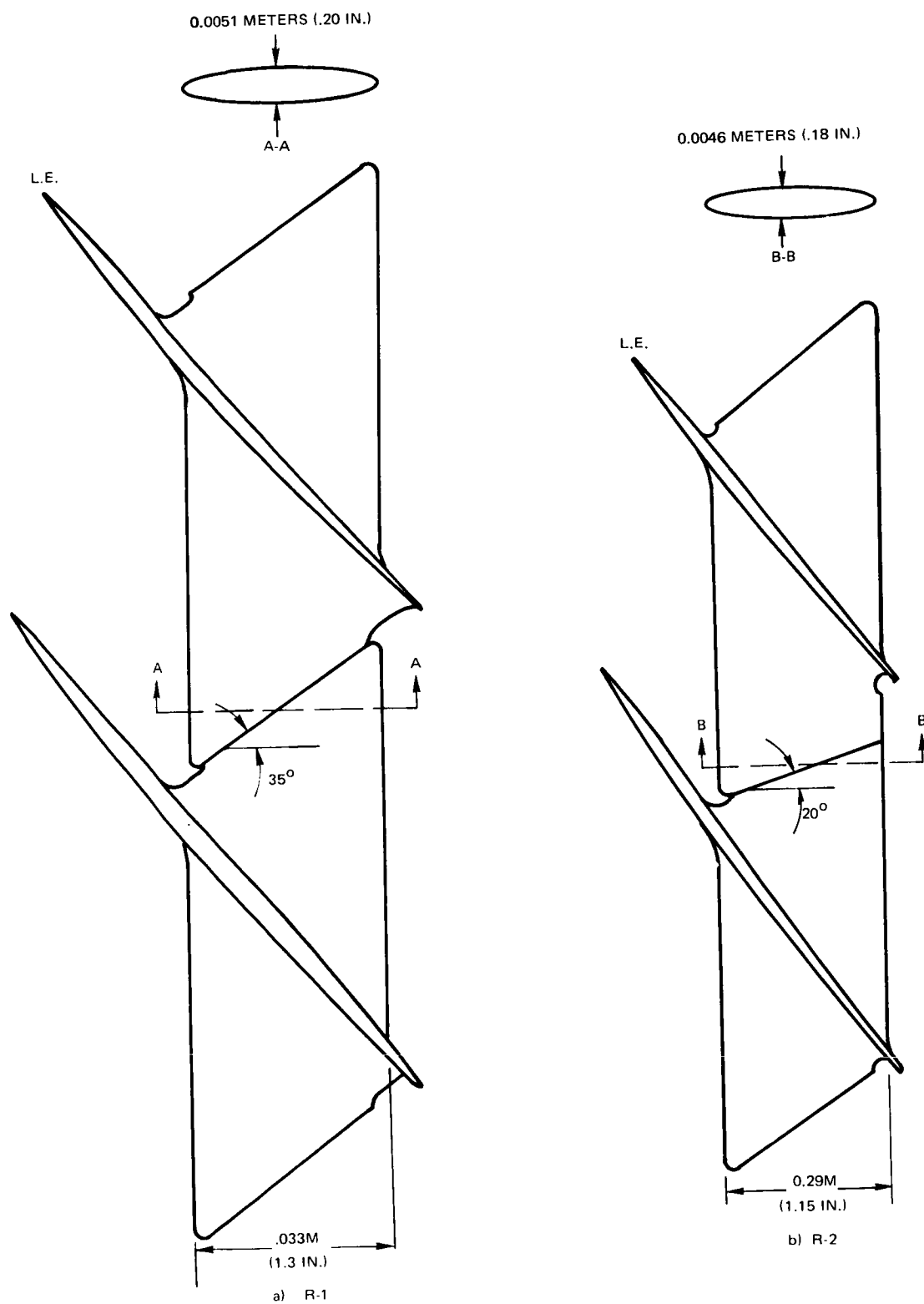
Figure 51   Schematic of Rotor Partspan Shrouds
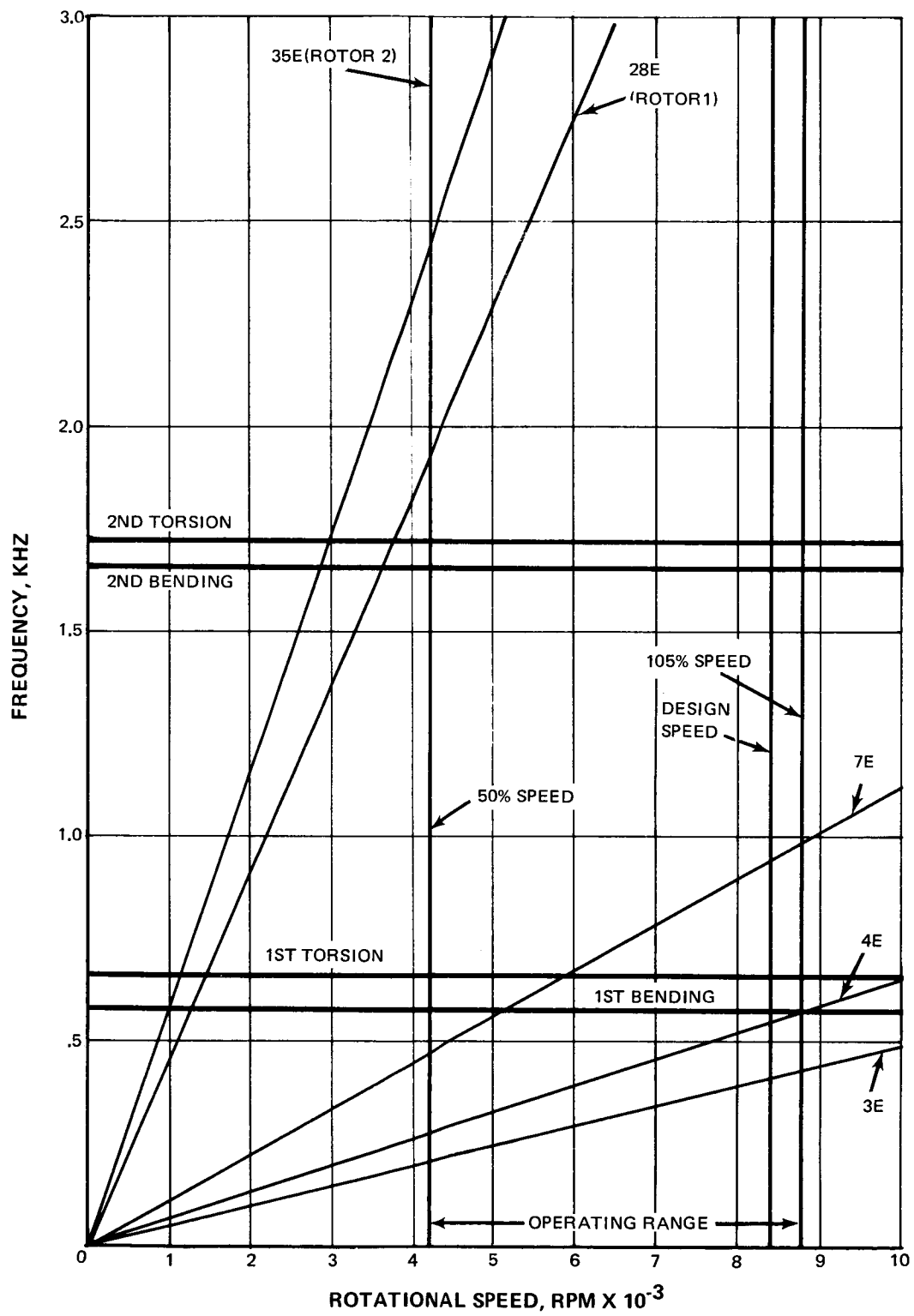
Figure 52   Stator 1 Campbell Diagram
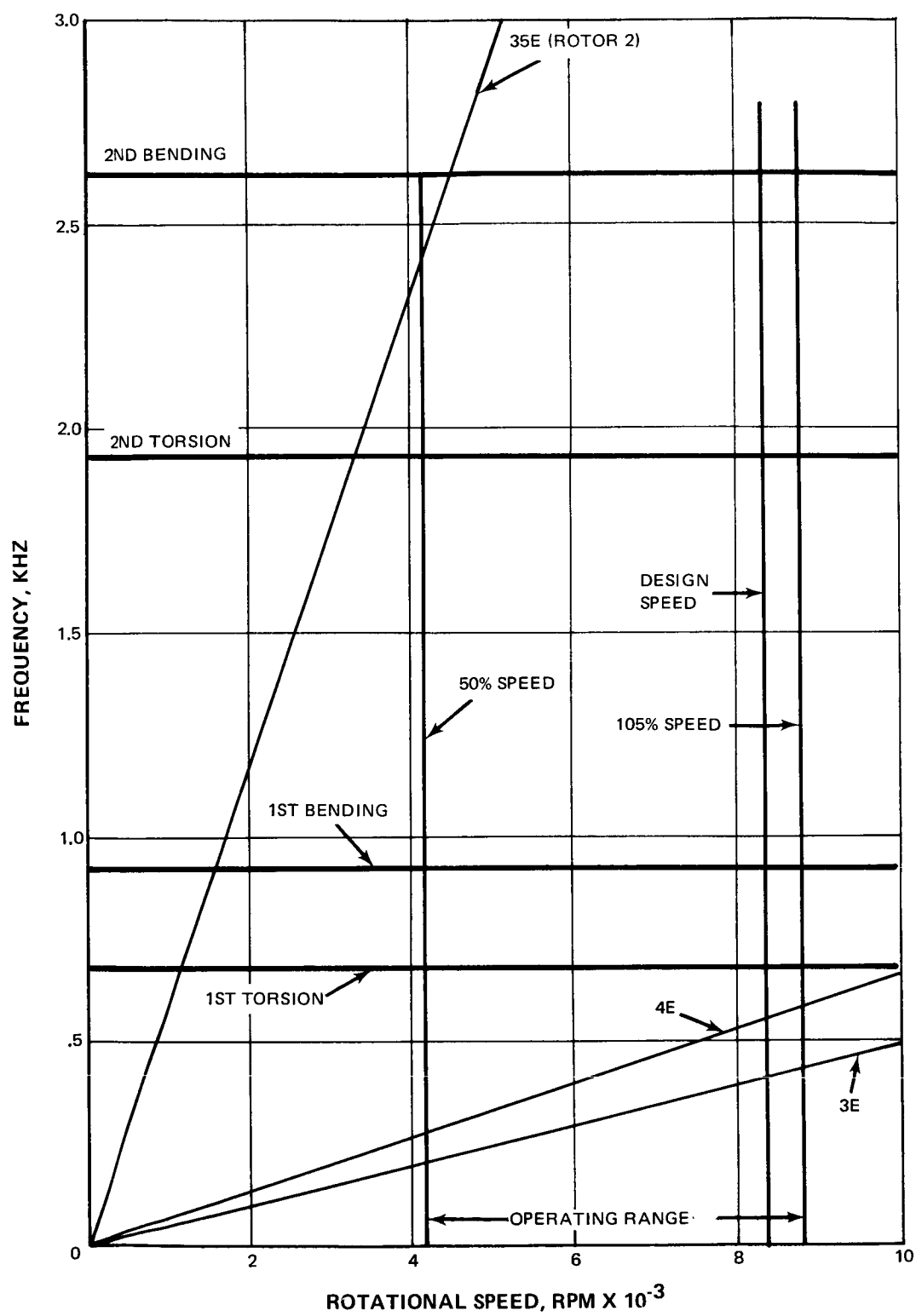
Figure 53   Stator 2 Campbell Diagram
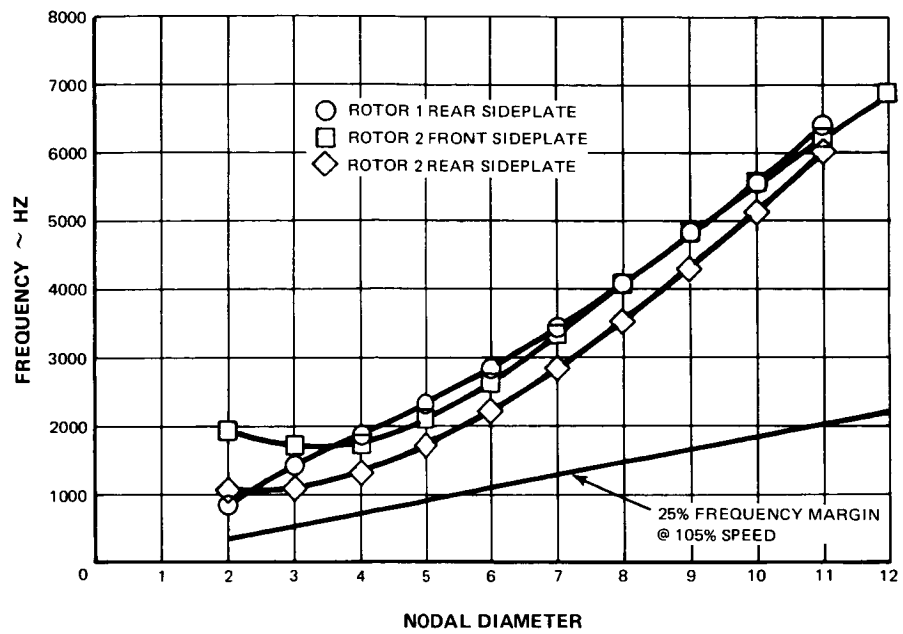
Figure 54   Rotor Sideplate Seal Resonance
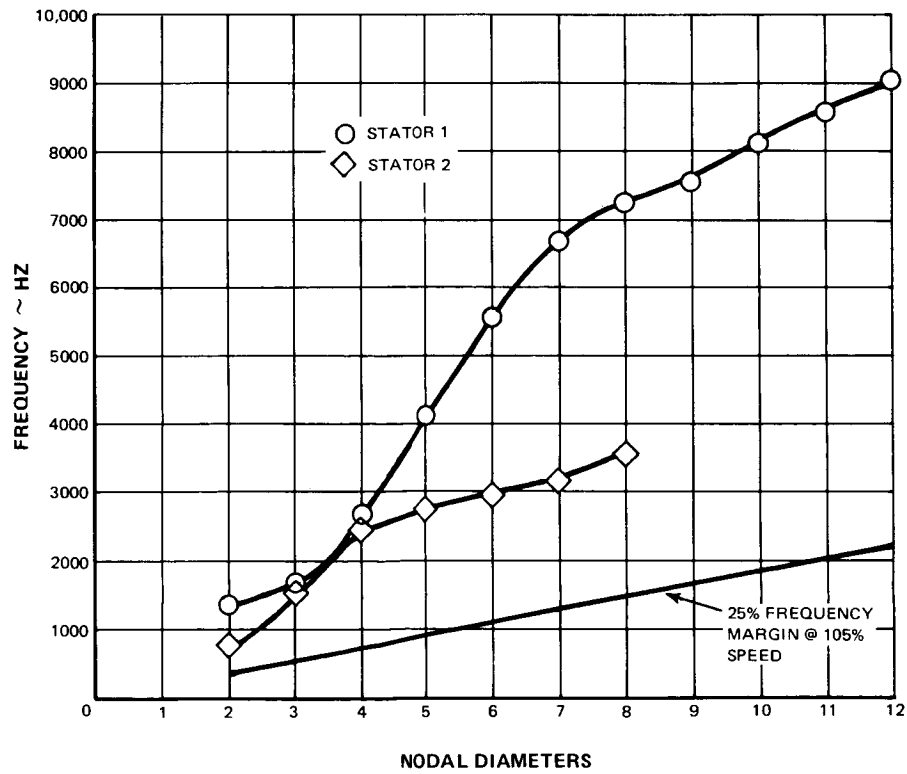
Figure 55   Stator Sideplate Seal Resonance

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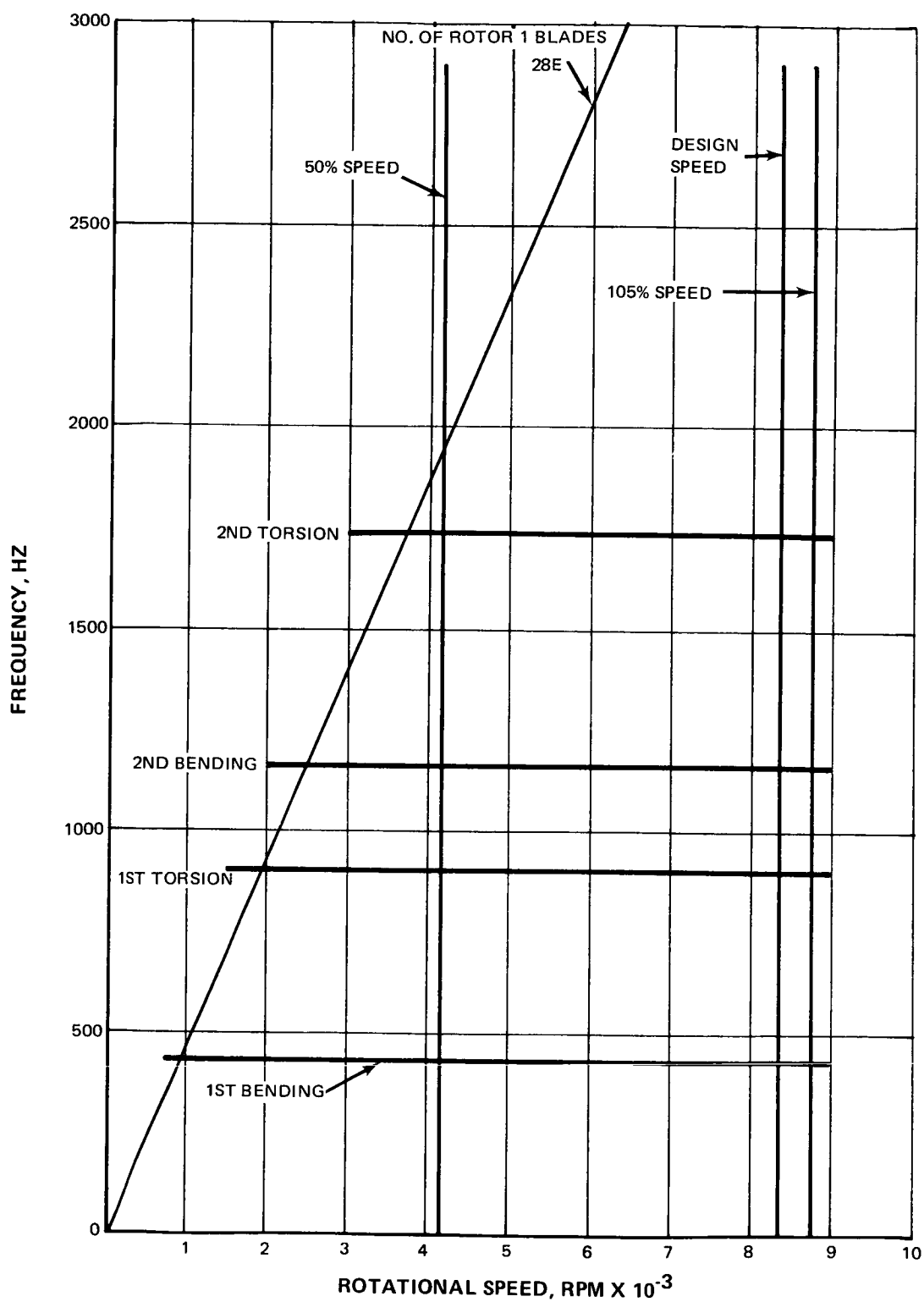
Figure 56   Sonic Inlet Support Struts, Campbell Diagram

Figure 57   Spring-Mass Model for Critical Speed Analysis - Standard Inlet

LINEAR SPRING RATES

lbf/in.	(N/m x 10^{-8})
K01 = 0.5	0.9
K02 = 2.0	3.5
K03 = 2.0	3.5
K05 = 2.0	3.5
K06 = 10.0	17.5
K10 = 10.0	17.5
K11 = 1.0	1.8
K13 = 10.0	17.5
K14 = 0.00045	0.0008
K17 = 1.0	1.8
K18 = 0.4	0.6

TORSIONAL SPRING RATES

in-lbf/deg x 10^{-8}	(m-N/rad x 10^{-9})
T06 = 4.0	2.6
T010 = 10.0	6.5
T011 = 50.0	32.5
T013 = 10.0	6.5
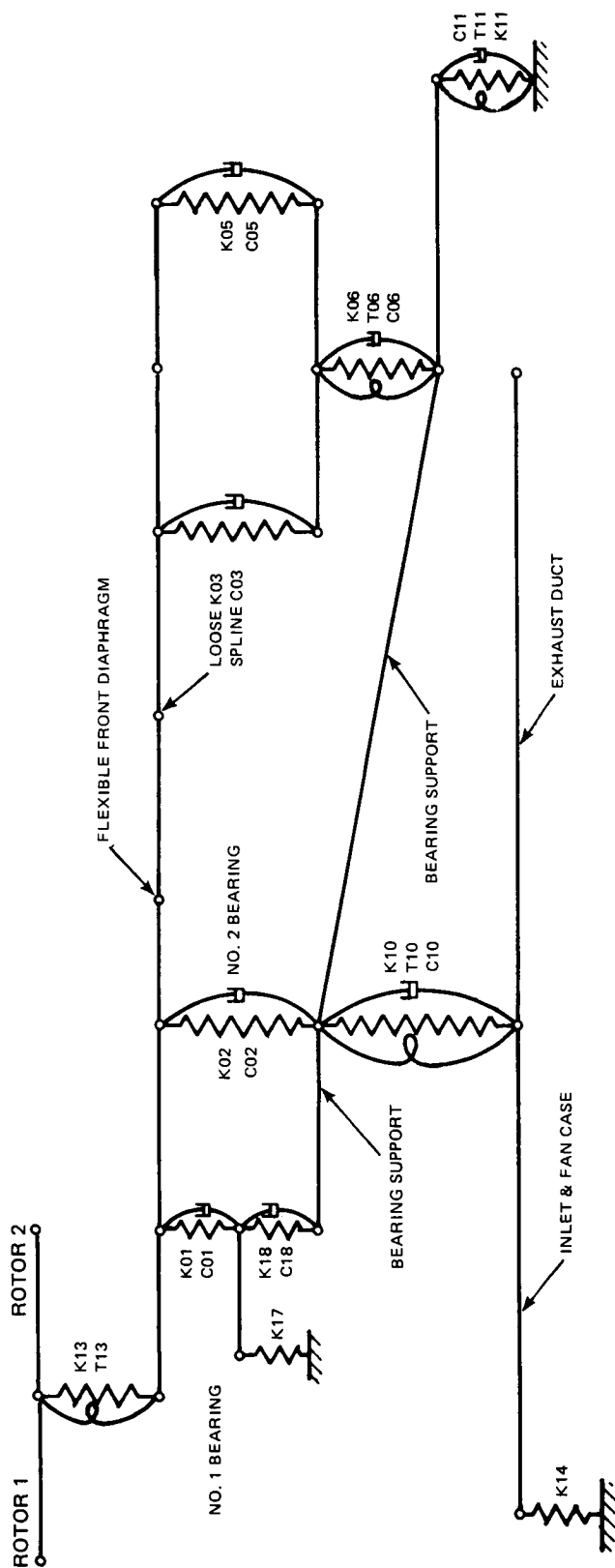
STRUCTURAL DAMPING COEFFICIENTS

lbf/in. -sec	(N/m - sec x 10^{-3})
C01 = 10	1.75
C02 = 10	1.75
C03 = 10	1.75
C05 = 10	1.75
C06 = 100	17.5
C10 = 100	17.5
C11 = 200	35.0
C18 = 400	70.0

ROTOR 1

ROTOR 2

K13
T13

K01
NO. 1
BEARING

K02
NO. 2
BEARING

K03

K05

K06
T06

T11
K11

K10
T10
EXHAUST
STRUTS

EXHAUST DUCT

K14
FAN INLET CASE

K15
T15
INLET
STRUTS

K16
T16

K17

ADJUSTABLE INLET

LINEAR SPRING RATES

	lbf/in. x 10^6	(N/m x 10^{-8})
K01 =	0.5	0.9
K02 =	2.0	3.5
K03 =	2.0	3.5
K05 =	2.0	3.5
K06 =	10.0	17.5
K10 =	10.0	17.5
K11 =	1.0	1.8
K13 =	10.0	17.5
K14 =	0.00045	0.0008
K15 =	10.0	17.5
K16 =	10.0	17.5
K17 =	10.0	17.5

TORSIONAL SPRING RATES

	in.-lbf/deg x 10^8	(m-N/rad x 10^{-9})
T06 =	4.0	2.6
T10 =	10.0	6.5
T11 =	50.0	32.5
T13 =	10.0	6.5
T15 =	0.1	0.065
T16 =	10.0	6.5

Figure 58   Spring-Mass Model for Critical Speed Analysis – Sonic Inlet

Upper plot labels: INLET & FAN CASES, FLEXIBLE FRONT DIAPHRAGM, BEARING SUPPORT, DRIVE SHAFT, NO. 2 BEARING, NO. 1 BEARING, FAN SHAFT, ROTOR 2, ROTOR 1, NATURAL FREQUENCY = 48112 RPM. Y-axis: RELATIVE DISPLACEMENT. X-axis: AXIAL DISTANCE.

Lower plot labels: INLET & FAN CASE, ROTOR 2, BEARING SUPPORT, NO. 1 BEARING, NO. 2 BEARING, FAN SHAFT, ROTOR 1, FLEXIBLE FRONT DIAPHRAGM, DRIVE SHAFT, NATURAL FREQUENCY = 8764 RPM. Y-axis: RELATIVE DISPLACEMENT. X-axis: AXIAL DISTANCE.

Figure 59   Critical Speed Mode Shapes
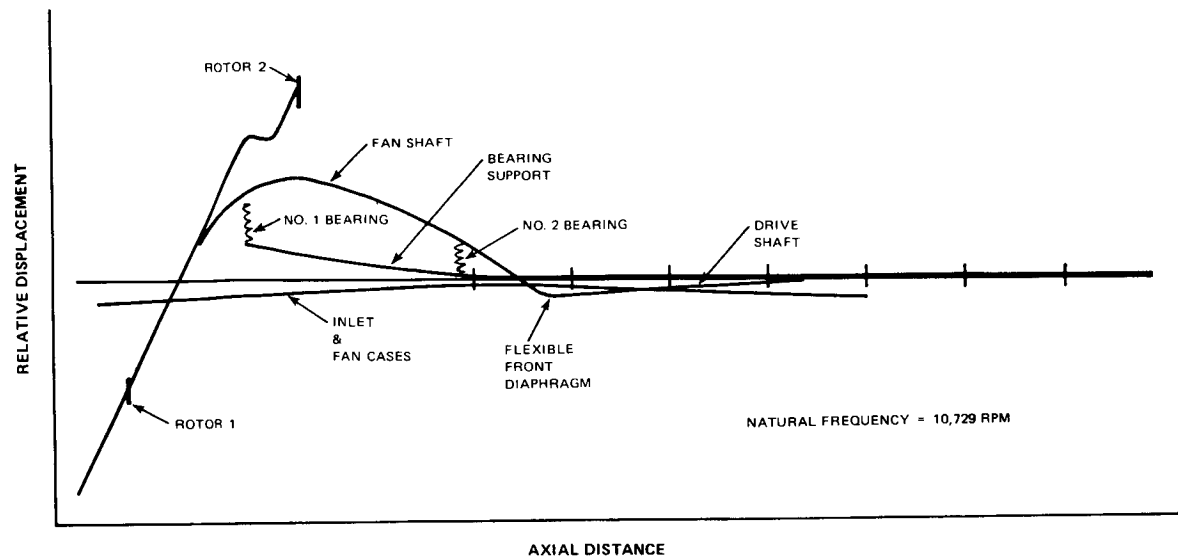
Figure 59 (Cont'd)   Critical Speed Mode Shapes

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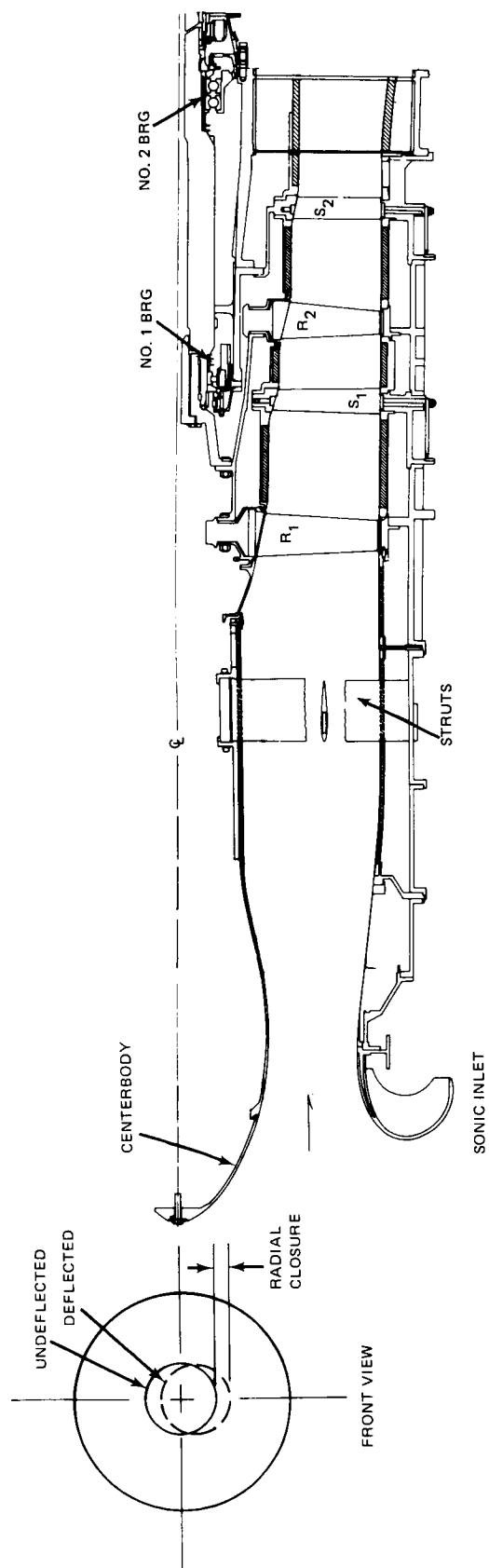
Figure 60   Schematic of Sonic Inlet Configuration
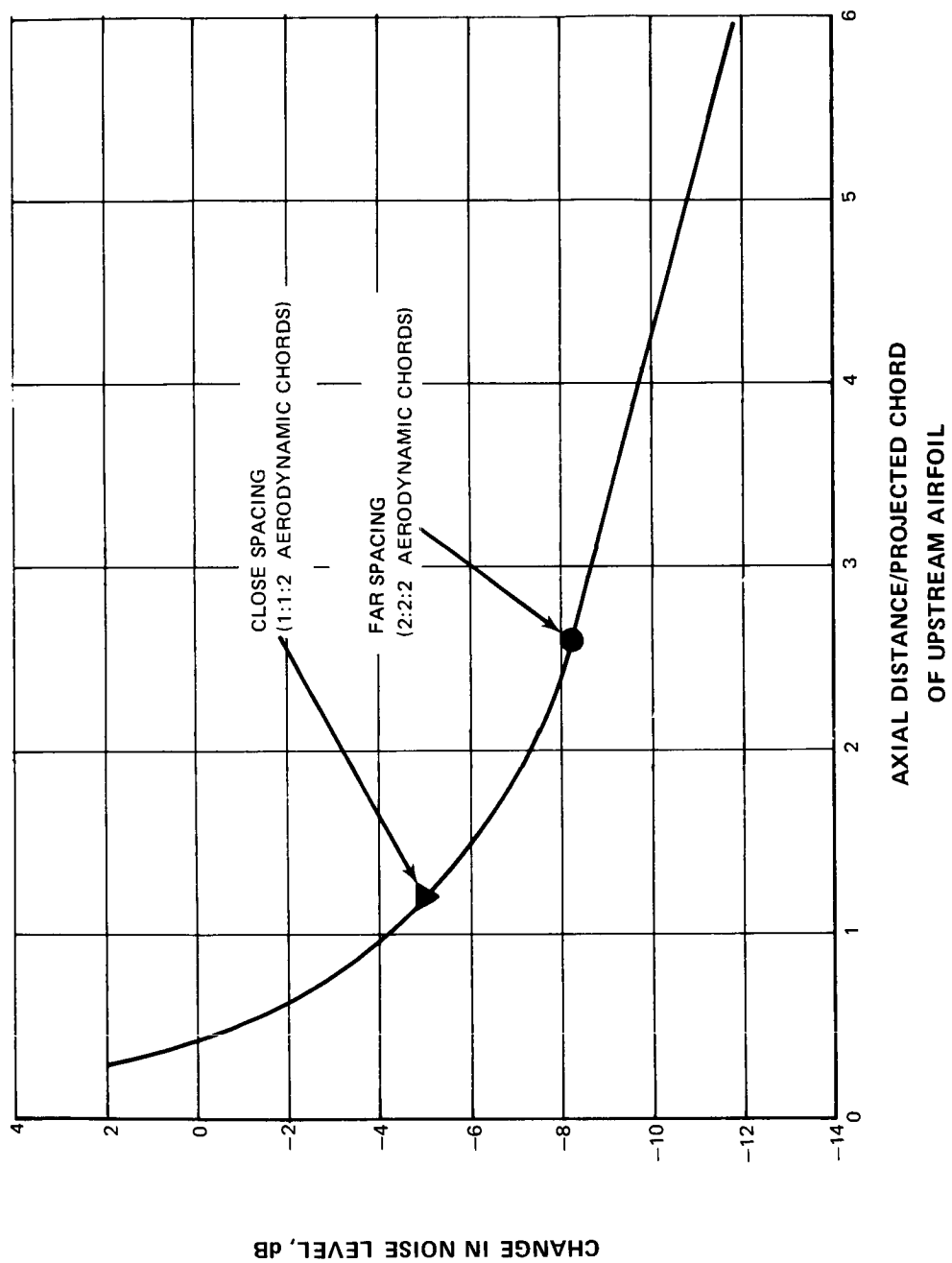
Figure 61   Effect of Rotor-Stator Spacing on Blade-Passing Frequency Noise Level
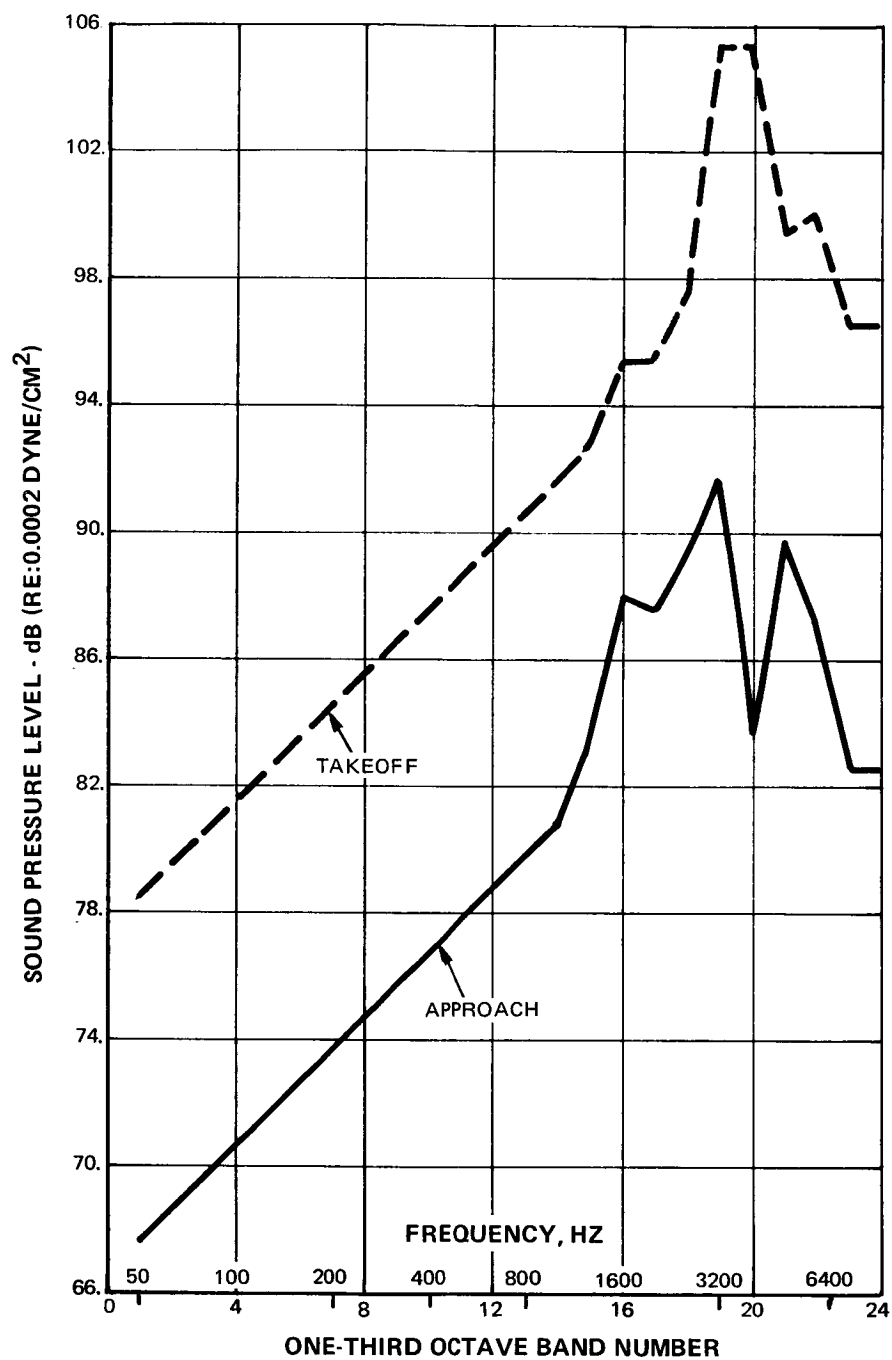
Figure 62   Fan Aft One-Third Octave Spectra — Untreated
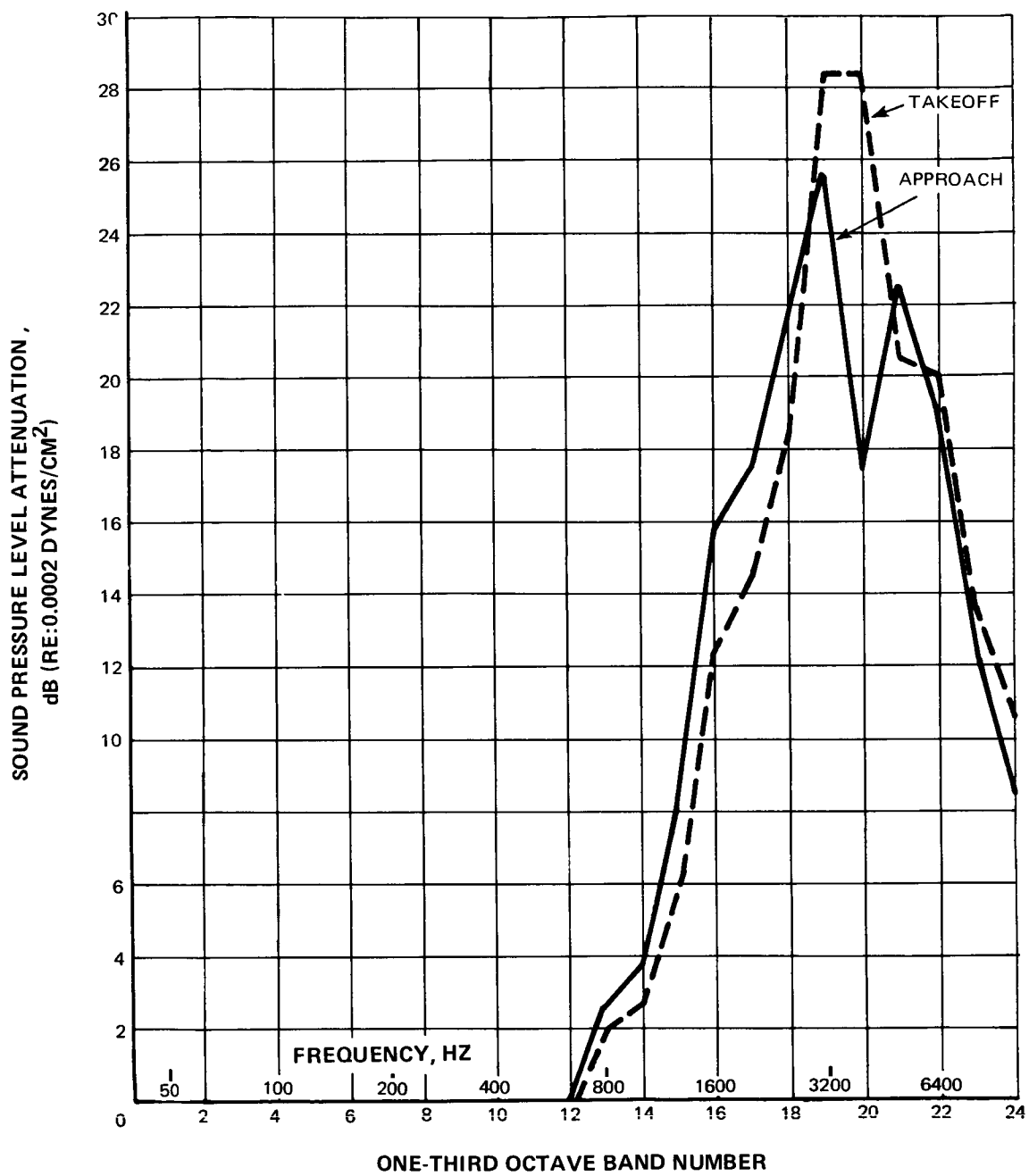
Figure 63   Fan Aft Noise Attenuation Targets

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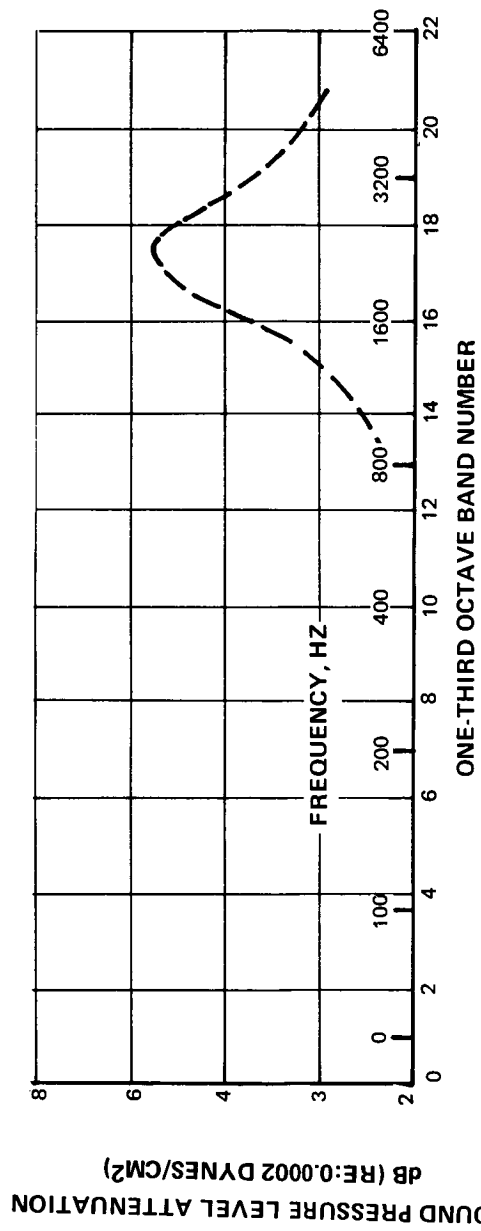
Figure 64   Inlet Estimated Attenuation Due to Wall Treatment – Approach

SONIC INLET

FAN EXIT NOZZLE

AFT SPLITTER

NO. 1 BRG

NO. 2 BRG

STRUT CASE

APPROACH POSITION

TAKE-OFF POSITION

CRUISE POSITION

ITEM NO.	LOCATION	HONEYCOMB DEPTH, METERS (IN.)	H/C CELL SIZE, METERS (INCHES)	FACING SHEET RESISTANCE (NORMALIZED)	% OPEN AREA
1	SONIC INLET ID & OD	0.006 (1/4)	0.0095 (3/8)	2	6
2	INTERSTAGE ID & OD	0.013 (1/2)	0.0095 (3/8)	1	14
3	EXIT WALLS ID & OD	0.025 (1)	0.0095 (3/8)	1.5	9
4	EXIT SPLITTER	0.006 (1/4)	0.0095 (3/8)	1.5	9

Figure 65   Summary of Fan Acoustic Treatments
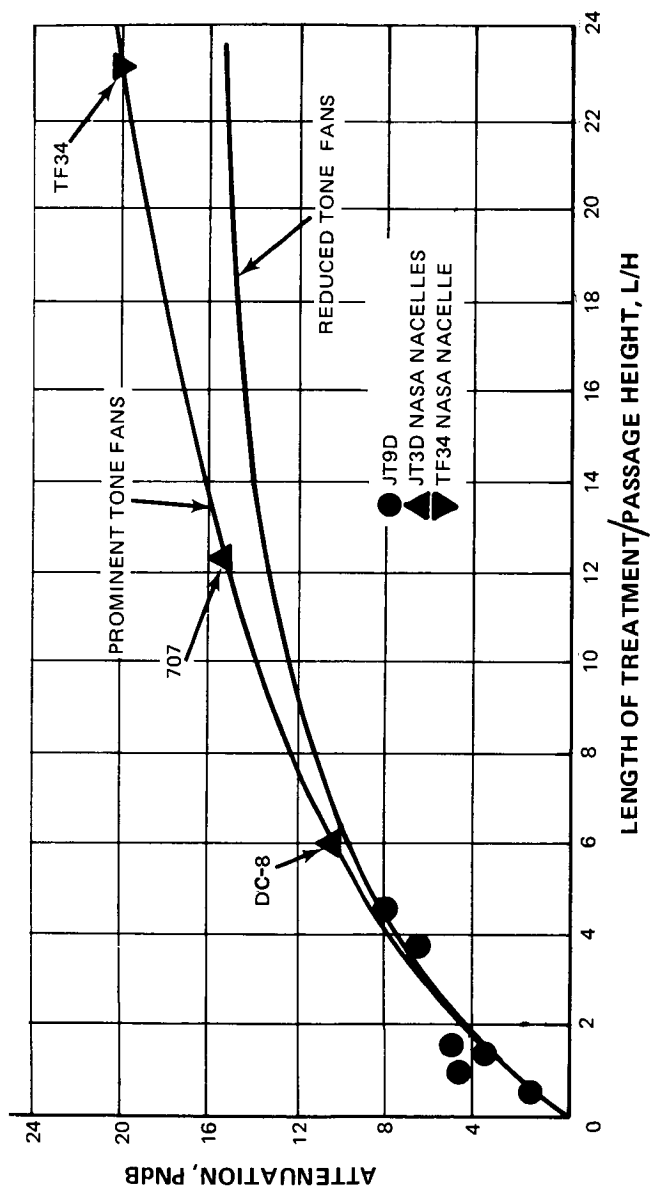
Figure 66   Treatment Attenuation — Fan Discharge Ducts
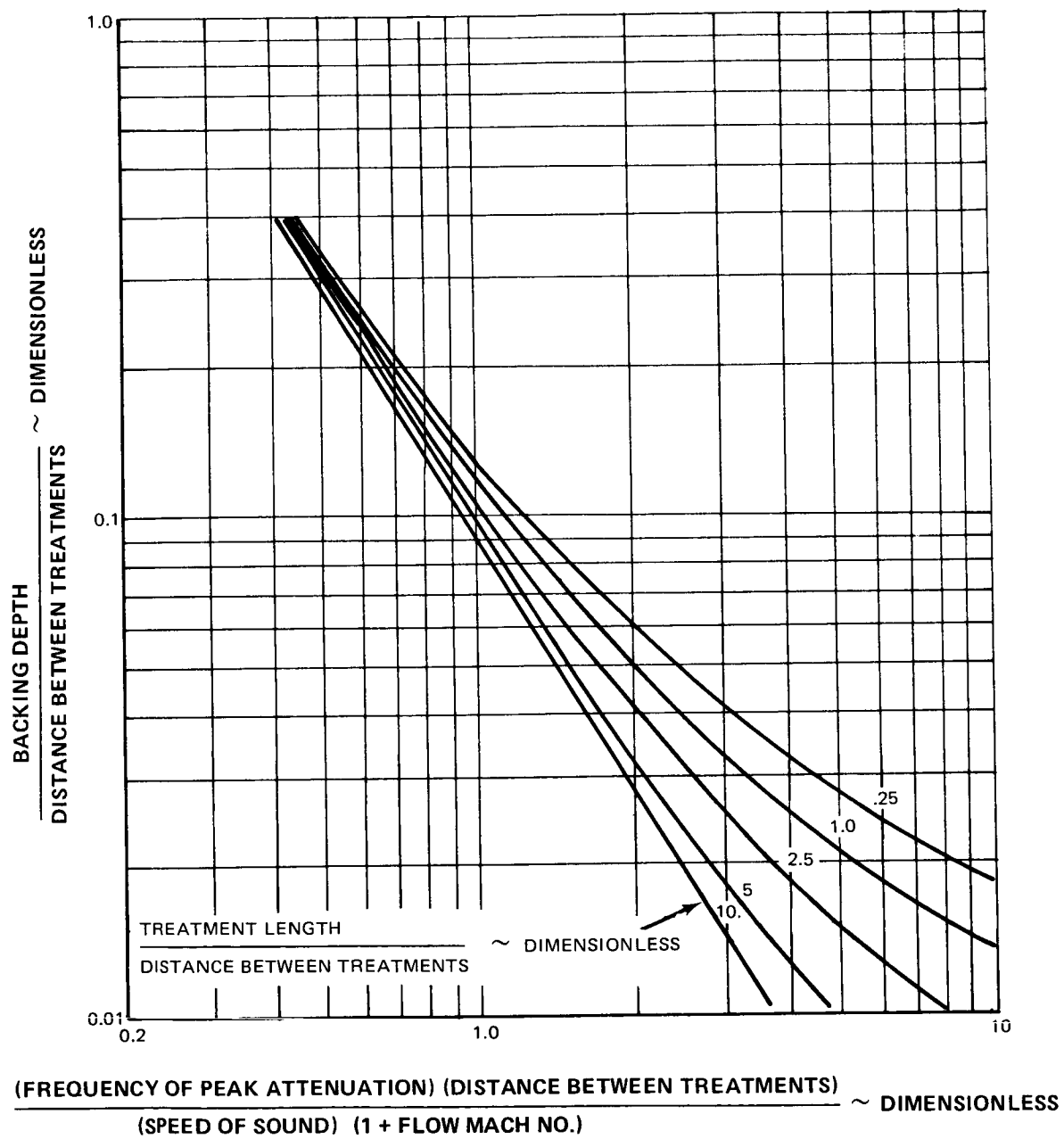
Figure 67   Tuning Curves
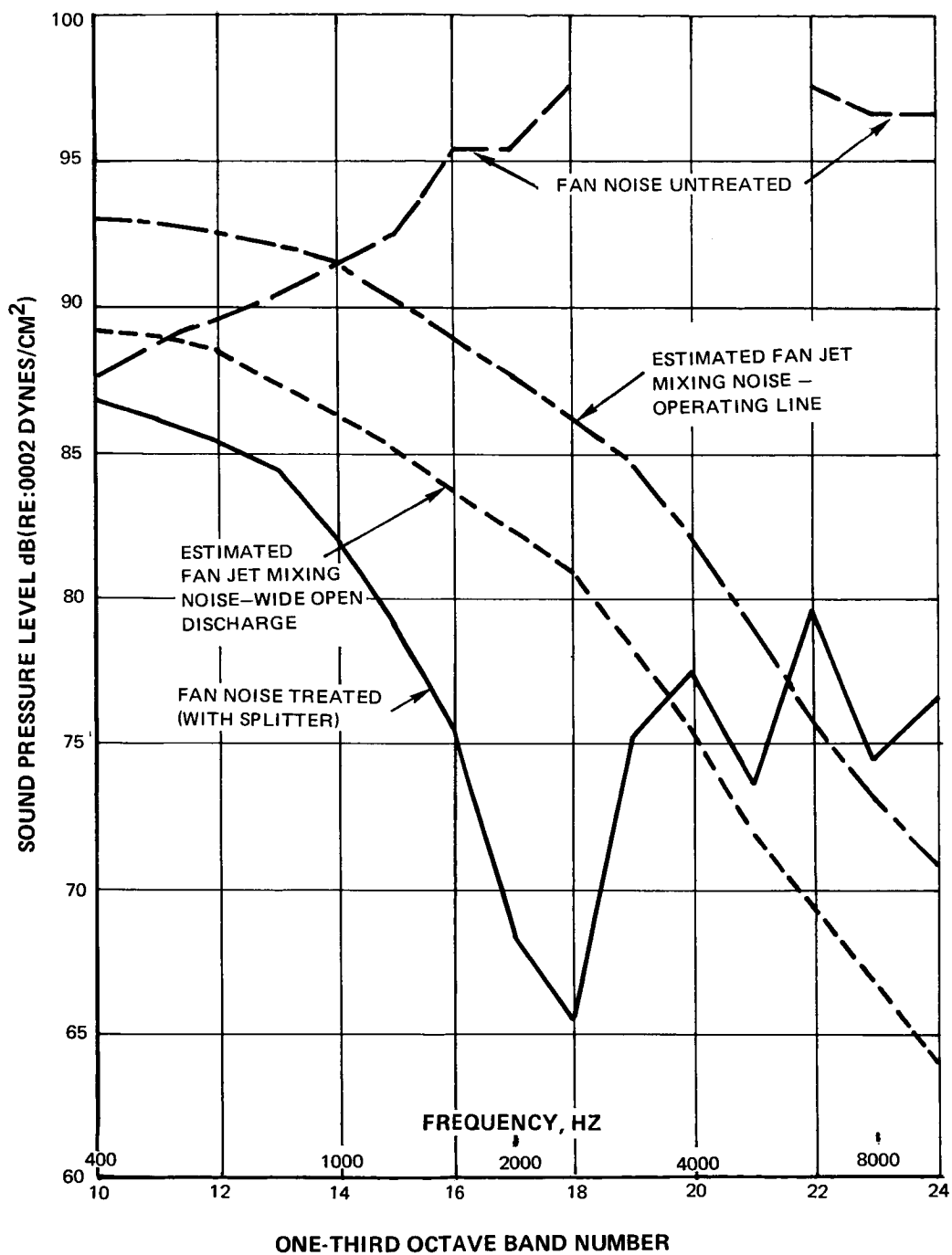
Figure 68   Analytically Predicted Attenuation of Aft Fan Noise at Takeoff
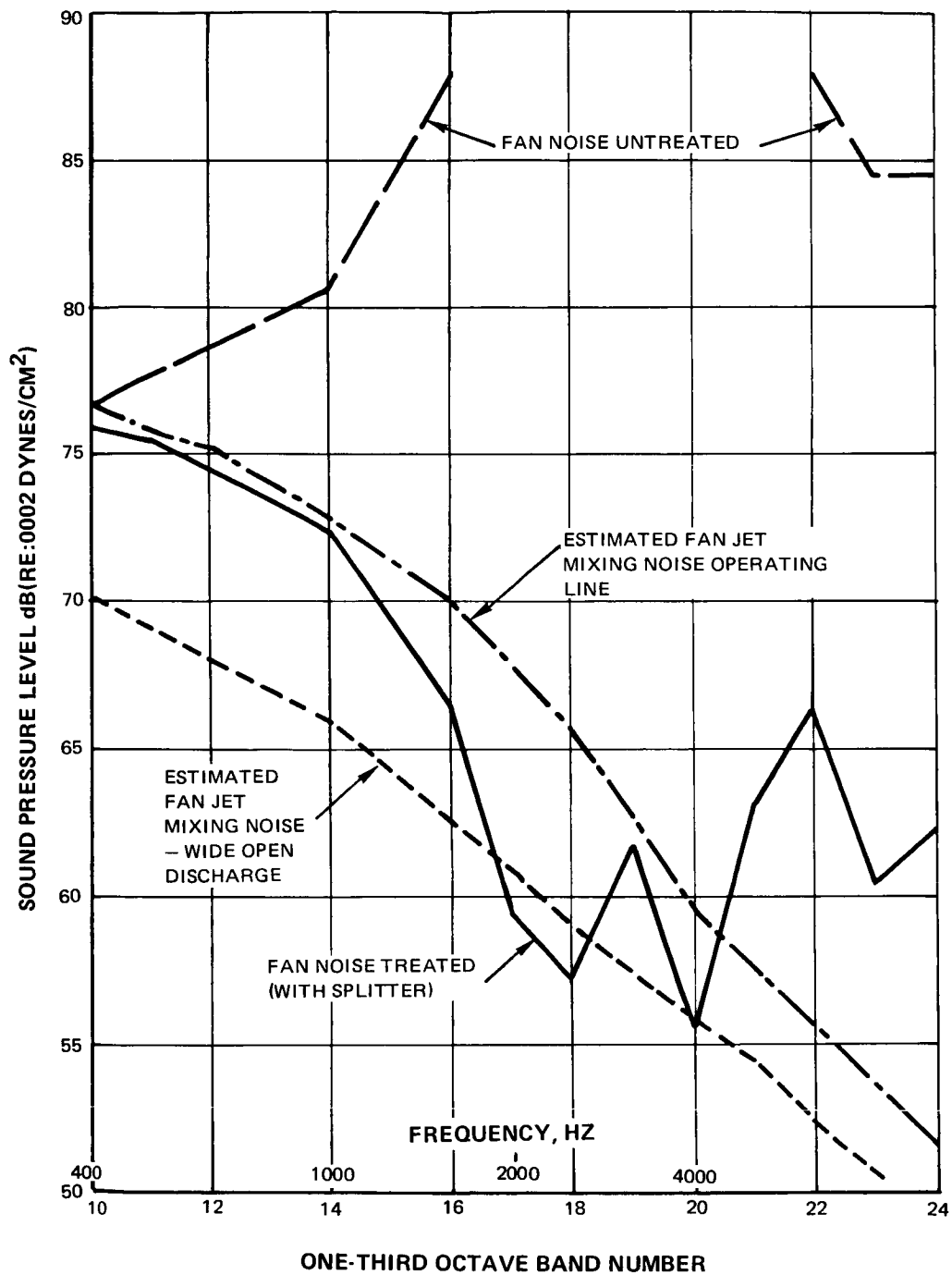
Figure 69   Predicted Jet and Treated Fan Noise Levels — Approach
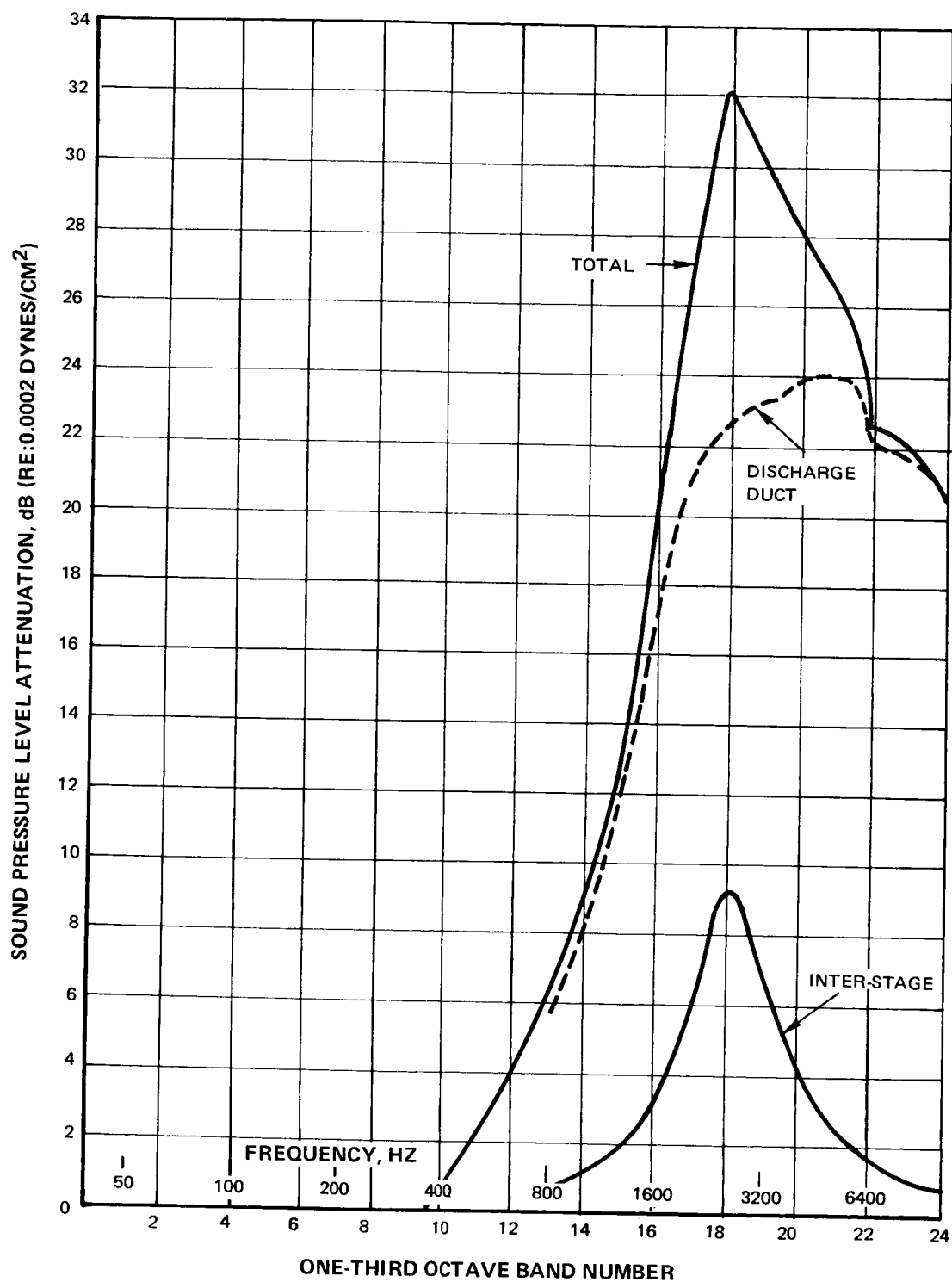
Figure 70   Predicted Jet and Treated Fan Noise Levels — Takeoff

APPENDIX A

SYMBOLS AND DEFINTIONS

A	area - meters^2 (feet^2)
A/A*	ratio of actual-area to critical-area (where local Mach number is 1.0)
a	distance along chord from leading edge of airfoil to point of maximum elevation of airfoil above chord line - meters (inches)
a$'$	a point on the suction surface of a blade halfway between the leading edge and the point from which a Mach wave emanates that meets the leading edge of the following blade
C	structural damping coefficient - N/m-sec (lbf/in.-sec)
c	Chord (aerodynamic on flow surface) - meters (inches)

D   diffusion factor,

$$\text{for rotor} = 1 - V_2'/V_1' + \frac{r_2 V_{\theta 2} - r_1 V_{\theta 1}}{(r_1 + r_2) V' \sigma}$$

$$\text{for stator} = 1 - V_3/V_2 + \frac{r_2 V_{\theta 2} - r_3 V_{\theta 3}}{(r_2 + r_3) V_2 \sigma}$$

d	displacement in the direction normal to the minimum moment of inertia axis - meters (inches)
E	epse, the angle between rays drawn to a conical design surface, one ray to the leading edge of an airfoil section, the second to some other point on the airfoil - degrees; excitations per rotor revolution
G	gravitational force
H	{ boundary layer shape factor { passage height
I	moment of inertia about minor axis - meters^4 (inches^4)
ID	inner diameter of casing - meters (inches)
i	incidence angle, inlet air angle minus blade metal angle - degrees
K	blockage factor; linear spring constant - N/m (lbf/in.)

SYMBOLS AND DEFINITIONS (Cont'd)

L   length of inlet - meters (inches)
               length of acoustic treatment

L.E.   leading edge of blade row

M   Mach number

MCA   multiple-circular-arc

N   rotor speed (rpm)

OD   outer diameter of casing - meters (inches)

p   static pressure - N/m^2 ($lbf/in.^2$)

P   total or stagnation pressure - N/m^2 ($lbf/in.^2$)

PNL   perceived noise level (dB)

RLE   leading edge airfoil radius - meters (inches)

RPM   revolutions per minute

RTE   trailing edge airfoil radius - meters (inches)

r   radius measured from rig centerline - meters (inches);
               number of rotor blades

R   rotor

r, θ, z   cylindrical coordinate system, with z axis as rig centerline

S   stator

s   blade spacing - meters (inches);
               number of stator vanes

SPL   sound pressure level (dB)

T   total temperature - °K (°R);
               torsional spring constant - m-N/rad (in. - lbf/deg)

T. E.   trailing edge of airfoil

t $\begin{cases} \text{blade maximum thickness - meters (inches)} \\ \text{throat} \end{cases}$

U   rotor speed - m/sec (ft/sec)

SYMBOLS AND DEFINITIONS (Cont'd)

V	air velocity - m/sec (ft/sec)
W	weight flow - kg/sec (lbm/sec)
Z^*ratio	$(I/C)_{\text{shroud cross-section}} / (I/C)_{\text{airfoil cross-section above shroud}}$
z	axial distance - meters (inches)
β	absolute air angle $[\cot^{-1} (V_m/V_\theta)]$ - degrees
Φ	vibratory twist deflection - degrees
β'	relative air angle $[\cot^{-1} (V_m/V'_\theta)]$ - degrees
β^*	metal angle, on conical surface, between tangent to mean camber line and meridional direction at leading and trailing edge - degrees
$\Delta\beta$	air turning angle - degrees
γ	blade chord angle, angle between a chord line and axial direction (measured in a plane parallel to z-axis) - degrees; ratio of specific heats for air
δ	ratio of total pressure to standard pressure of 1.01×10^5 N/m^2 (2116 lbf/ft^2)
$\delta°$	deviation angle, exit air angle minus tangent to blade mean camber line at trailing edge - degrees
ϵ	angle between tangent to streamline projected on meridional plane and axial direction - degrees
η	efficiency (percent)
θ	ratio of total temperature to standard temperature of 518.7°R
ρ	mass density - kg/m^3 (lbm/ft^3)
σ	solidity, ratio of aerodynamic chord to gap between blades
ϕ	blade camber angle, difference between blade angles at leading and trailing edges on conical surface, $\beta'^*_1 - \beta'^*_2$ for rotors and $\beta^*_2 - \beta^*_3$ for stators - degrees
ϕE	blade camber angle on plane of "unwrapped" conical surface $\beta'^*_1 - \beta'^*_2 - E_{TE}$ for rotors and $\beta^*_2 - \beta^*_3 - E_{TE}$ for stators - degrees
ψ	amplitude of torsional vibration (radians)

SYMBOLS AND DEFINTIONS (Cont'd)

$\bar{\omega}$ total pressure loss coefficient,

$$\frac{P_1' \left[\left[\dfrac{T_2'}{T_1'}\right] ^{\frac{\gamma}{\gamma-1}} \right] - P_2'}{P_1' - P_1} \quad \text{(rotors)}$$

$$\frac{P_2 - P_3}{P_2 - P_2} \quad \text{(stators)}$$

ω_b bending vibrational frequency (Hz)

ω_t torsional vibrational frequency (rad/sec)

Subscripts

ad   adiabatic

f   front

Ef   refers to front camber definitions which include epse angle E

in   inlet

LE   leading edge

m   meridional (velocity); mean camber line (angle)

p   profile (loss); polytropic (efficiency)

ss   suction surface

st   stage

t   transition, throat

TE   trailing edge

z   axial component

θ tangential component

o   plenum chamber

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SYMBOLS AND DEFINITIONS (Cont'd)

1   station into rotor

2   station out of rotor or into stator

3   station out of stator

Superscripts

$'$ relative to rotor

$*$ blade metal (angle); critical, at Mach number unity (area)

APPENDIX B
AERODYNAMIC SUMMARY
TABLE XIV

IDENTIFICATION OF AERODYNAMIC SUMMARY TABLE HEADINGS

ROTOR

SL	EPSI-1 DEGREE	EPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	Vθ-1 FT/SEC	Vθ-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	M-1	M-2	U-1 FT/SEC	U-2 FT/SEC	M'-1	M'-2	V'-1 FT/SEC	V'-2 FT/SEC
•	ϵ_1	ϵ_2	V_1	V_2	V_{m1}	V_{m2}	$V_{\theta 1}$	$V_{\theta 2}$	β_1	β_2	M_1	M_2	U_1	U_2	M'_1	M'_2	V'_1	V'_2

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	LOSS-P TOTAL	OMEGA-B TOTAL	PO2/PO1	%EFF-P TOT	%EFF-A TOT	B'-1 DEGREE	B'-2 DEGREE	Vθ'-1 FT/SEC	Vθ'-2 FT/SEC	PO/PO INLET
•	i_{ss_1}	i_{m1}	δ°_2	$\Delta\beta$	$\rho_1 V_{m1}$	$\rho_2 V_{m2}$	D	$\dfrac{\bar{\omega}\cos\beta'_2}{2\sigma}$	$\bar{\omega}$	$\dfrac{P_2}{P_1}$	η_p	η_{ad}	β'_1	β'_2	$V'_{\theta 1}$	$V'_{\theta 2}$	$\dfrac{P_2}{P_o}$

TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	WC1/A1 LBM/SEC SQFT	TO2/TO1	PO2/PO1	EFF-AD ROTOR %	EFF-P ROTOR %
$\dfrac{T_2}{T_o}$	$\dfrac{P_2}{P_o}$	η_{ad}	η_p	$\dfrac{w\sqrt{\theta_1}}{\delta_1 A_1}$	$\dfrac{T_2}{T_1}$	$\dfrac{P_2}{P_1}$	η_{ad_2}	η_{p2}

STATOR

SL	EPSI-1 DEGREE	EPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	Vθ-1 FT/SEC	Vθ-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	M-1	M-2	TO/TO INLET	PO/PO STAGE	TO2/TO1
•	ϵ_2	ϵ_3	V_2	V_3	V_{m2}	V_{m3}	$V_{\theta 2}$	$V_{\theta 3}$	β_2	β_3	M_2	M_3	$\dfrac{T_3}{T_o}$	$\dfrac{P_3}{P_1}$	$\dfrac{T_3}{T_1}$

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	LOSS-P TOTAL	OMEGA-B TOTAL	PO2/PO1	%EFF-P STATC-ST	%EFF-A TOT-INLET	%EFF-P TOT-INLET	TO/TO INLET	PO/PO STAGE	%EFF-A TOT-STG	%EFF-P TOT-STG
•	i_{ss_2}	i_{m2}	δ_3	$\Delta\beta$	$\rho_2 V_{m2}$	$\rho_3 V_{m3}$	D	$\dfrac{\bar{\omega}\cos\beta_3}{2\sigma}$	$\bar{\omega}$	$\dfrac{P_3}{P_2}$	$\eta_{ps\text{-}st}$	η_{ad}	η_p	$\dfrac{T_3}{T_o}$	$\dfrac{P_3}{P_1}$	$\eta_{ad\text{-}st}$	$\eta_{p\text{-}st}$

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	TO2/TO1	PO2/PO1	EFF-AD STAGE %
$\dfrac{N}{\sqrt{\theta_1}}$	$\dfrac{w\sqrt{\theta_1}}{\delta_1}$	$\dfrac{T_3}{T_o}$	$\dfrac{P_3}{P_o}$	η_{ad}	η_p	$\dfrac{T_3}{T_1}$	$\dfrac{P_3}{P_2}$	$\eta_{ad\text{-}st}$

TABLE XV

IDENTIFICATION OF SPANS AND DIAMETERS FOR BLADE ELEMENT DATA

SL	ROTOR 1 INLET DIA. (in.)	SPAN (%)	ROTOR 1 EXIT DIA. (in.)	SPAN (%)	STATOR 1 INLET DIA. (in.)	SPAN (%)	STATOR 1 EXIT DIA. (in.)	SPAN (%)
1	13.16	0.0	14.60	0.0	15.48	0.0	16.46	0.0
2	14.15	5.0	15.52	5.0	16.41	5.3	17.16	4.2
3	15.19	10.3	16.43	10.0	17.30	10.5	17.90	8.8
4	16.23	15.6	17.35	15.0	18.19	15.6	18.67	13.5
5	17.28	20.9	18.26	20.0	19.07	20.6	19.47	18.3
6	19.34	31.3	20.09	30.0	20.81	30.6	21.08	28.1
7	21.38	41.6	21.93	40.0	22.56	40.6	22.75	38.2
8	23.38	51.8	23.76	50.1	24.29	50.6	24.43	48.5
9	25.32	61.6	25.57	59.9	25.99	60.4	26.10	58.6
10	26.30	66.6	26.49	65.0	26.86	65.3	26.96	63.9
11	27.27	71.5	27.41	70.0	27.73	70.3	27.81	69.0
12	29.20	81.2	29.24	80.0	29.45	80.2	29.52	79.4
13	30.15	86.1	30.16	85.0	30.32	85.2	30.38	84.7
14	31.09	90.8	31.07	90.0	31.18	90.1	31.23	89.9
15	32.01	95.5	31.99	95.0	32.04	95.1	32.08	95.0
16	32.90	100.0	32.90	100.0	32.90	100.0	32.90	100.0

SL	ROTOR 2 INLET DIA. (in.)	SPAN (%)	ROTOR 2 EXIT DIA. (in.)	SPAN (%)	STATOR 2 INLET DIA. (in.)	SPAN (%)	STATOR 2 EXIT DIA. (in.)	SPAN (%)
1	16.89	0.0	18.28	0.0	18.55	0.0	19.30	0.0
2	17.66	4.8	18.85	3.9	19.19	4.5	19.82	3.8
3	18.44	9.7	19.45	8.0	19.84	9.0	20.37	7.9
4	19.22	14.6	20.08	12.3	20.50	13.6	20.95	12.1
5	20.01	19.5	20.73	16.8	21.17	18.2	21.55	16.5
6	21.59	29.3	22.08	26.0	22.52	27.6	22.78	25.6
7	23.18	39.3	12.49	35.6	23.90	37.3	24.08	35.2
8	24.78	49.3	24.96	45.7	25.32	47.2	25.43	45.1
9	26.38	59.3	26.45	55.9	26.75	57.1	26.82	55.3
10	27.19	64.4	27.22	61.2	27.49	62.3	27.54	60.6
11	28.01	69.4	28.00	66.5	28.23	67.5	28.27	66.0
12	29.64	79.7	29.59	77.4	29.75	78.0	29.77	77.0
13	30.47	84.8	30.40	82.9	30.52	83.4	30.54	82.7
14	31.29	90.0	31.23	88.6	31.31	88.9	31.33	88.4
15	32.11	95.0	32.07	94.3	32.11	94.5	32.11	94.2
16	32.90	100.0	32.90	100.0	32.90	100.0	32.90	100.0

TABLE XVI

AERODYNAMIC SUMMARY – ROTOR 1
SI Units)

SL	EPSI-1 RADIAN	EPSI-2 RADIAN	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VØ-1 M/SEC	VØ-2 M/SEC	B-1 RADIAN	M-1	B-2 RADIAN	M-2	U-1 M/SEC	U-2 M/SEC	M'-1	M'-2	V'-1 M/SEC	V'-2 M/SEC
1	0.2211	0.1943	214.4	323.2	214.4	185.1	0.0	265.0	0.0	0.6567	0.9599	0.9656	146.4	162.4	0.7952	0.6322	259.7	211.6
2	0.2125	0.1655	215.7	305.2	215.7	196.8	0.0	233.2	0.0	0.6609	0.8673	0.9068	157.4	172.6	0.8183	0.6619	267.1	205.9
3	0.1985	0.1420	216.9	290.3	216.9	198.3	0.0	212.1	0.0	0.6648	0.8162	0.8584	168.9	182.8	0.8427	0.5926	274.9	200.4
4	0.1816	0.1229	218.0	277.8	218.0	197.0	0.0	195.9	0.0	0.6685	0.7800	0.8177	180.6	193.0	0.8681	0.5800	283.1	197.1
5	0.1645	0.1073	218.9	267.2	218.9	194.1	0.0	183.7	0.0	0.6717	0.7556	0.7833	192.2	203.2	0.8939	0.5718	291.3	195.1
6	0.1318	0.0821	220.3	249.2	220.3	188.3	0.0	163.9	0.0	0.6762	0.7149	0.7271	215.2	223.8	0.9453	0.5751	307.9	197.5
7	0.1019	0.0638	221.0	236.4	221.0	183.1	0.0	149.5	0.0	0.6786	0.6838	0.6847	237.9	243.9	0.9970	0.5969	324.7	206.0
8	0.0760	0.0469	221.2	226.2	221.2	179.3	0.0	137.8	0.0	0.6792	0.6551	0.6526	260.1	264.4	1.0485	0.6331	341.4	219.4
9	0.0539	0.0357	221.0	218.7	221.0	176.5	0.0	129.2	0.0	0.6785	0.6315	0.6291	281.7	284.5	1.0994	0.6763	358.0	235.1
10	0.0435	0.0293	220.8	215.6	220.8	175.4	0.0	125.3	0.0	0.6781	0.6204	0.6191	292.6	294.7	1.1257	0.7003	366.6	243.9
11	0.0337	0.0231	220.8	212.9	220.8	174.4	0.0	122.1	0.0	0.6779	0.6107	0.6105	303.5	304.9	1.1522	0.7247	375.3	252.7
12	0.0161	0.0112	220.4	208.6	220.4	172.1	0.0	118.0	0.0	0.6767	0.6010	0.5963	324.8	325.3	1.2052	0.7701	392.6	269.4
13	0.0086	0.0059	220.1	207.0	220.1	170.8	0.0	117.0	0.0	0.6757	0.6007	0.5906	335.5	335.5	1.2317	0.7912	401.3	277.3
14	0.0027	0.0018	219.8	206.9	219.8	167.5	0.0	121.4	0.0	0.6746	0.6271	0.5875	345.9	345.7	1.2579	0.7951	409.9	280.0
15	-0.0005	-0.0004	219.5	206.7	219.5	163.6	0.0	126.4	0.0	0.6737	0.6577	0.5841	356.1	355.9	1.2839	0.7966	418.4	281.9
16	0.0000	-0.0000	219.4	206.6	219.4	158.0	0.0	136.1	0.0	0.6732	0.7110	0.5853	366.0	366.0	1.3095	0.7830	426.7	279.0

SL	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	B-1 RADIAN	B-2 RADIAN	%EFF-A TOT	%EFF-P TOT	A'-1 RADIAN	B'-2 RADIAN	VØ'-1 M/SEC	VØ'-2 M/SEC	PO/PO INLET
1	-0.0665	0.0317	0.2347	1.1055	43.76	40.22	0.4215	0.1850	0.0357	0.9599	0.6567	86.96	86.16	0.6006	-0.5048	-146.4	102.5	1.5250
2	-0.0405	0.0566	0.2617	0.9295	43.90	44.97	0.4396	0.1091	0.0243	0.8673	0.6609	91.56	91.05	0.6323	-0.2972	-157.4	60.6	1.5180
3	-0.0310	0.0646	0.2746	0.8096	44.04	47.02	0.4642	0.0743	0.0180	0.8162	0.6648	93.81	93.24	0.6638	-0.1457	-168.9	29.3	1.5110
4	-0.0243	0.0697	0.2725	0.7085	44.16	48.09	0.4837	0.0546	0.0141	0.7800	0.6685	95.14	94.85	0.6938	-0.0147	-180.6	2.9	1.5050
5	-0.0179	0.0749	0.2690	0.6227	44.26	48.46	0.5001	0.0476	0.0128	0.7556	0.6717	95.53	95.26	0.7224	0.0997	-192.2	-19.5	1.5000
6	-0.0097	0.0804	0.2437	0.4696	44.41	48.63	0.5121	0.0416	0.0117	0.7149	0.6762	95.66	95.41	0.7751	0.3055	-215.2	-59.6	1.4905
7	-0.0097	0.0759	0.1951	0.3473	44.49	48.39	0.5070	0.0444	0.0124	0.6838	0.6786	95.00	94.71	0.8230	0.4757	-237.9	-94.5	1.4837
8	-0.0167	0.0638	0.1462	0.2524	44.51	48.17	0.4893	0.0473	0.0130	0.6551	0.6792	94.29	93.96	0.8666	0.6141	-260.1	-126.5	1.4790
9	-0.0149	0.0571	0.1228	0.1845	44.49	47.99	0.4681	0.0530	0.0142	0.6315	0.6785	93.23	92.84	0.9060	0.7215	-281.7	-155.3	1.4770
10	-0.0035	0.0555	0.1137	0.1564	44.48	47.89	0.4565	0.0563	0.0149	0.6204	0.6781	92.62	92.20	0.9245	0.7681	-292.6	-169.4	1.4760
11	0.0109	0.0552	0.1116	0.1328	44.47	47.80	0.4456	0.0605	0.0158	0.6107	0.6779	91.87	91.41	0.9420	0.8091	-303.5	-182.9	1.4756
12	0.0213	0.0604	0.1080	0.0965	44.43	47.37	0.4294	0.0776	0.0198	0.6010	0.6767	89.24	88.64	0.9746	0.8781	-324.8	-207.3	1.4753
13	0.0251	0.0639	0.1066	0.0827	44.40	47.04	0.4240	0.0905	0.0229	0.6007	0.6757	87.37	86.66	0.9901	0.9074	-335.5	-218.5	1.4755
14	0.0276	0.0663	0.1166	0.0753	44.36	45.93	0.4367	0.1288	0.0324	0.6007	0.6746	82.48	81.49	1.0048	0.9294	-345.9	-224.3	1.4783
15	0.0250	0.0637	0.1453	0.0667	44.33	44.61	0.4514	0.1687	0.0422	0.6577	0.6737	77.71	76.44	1.0184	0.9517	-356.1	-229.6	1.4811
16	0.0180	0.0566	0.2059	0.0623	44.32	42.72	0.4815	0.2258	0.0565	0.7110	0.6732	71.74	70.12	1.0309	0.9686	-366.0	-229.9	1.4901

TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	WC1/A1 KG/SEC SQM
1.1336	1.4849	89.52	90.09	209.11

TO2/TO1	PO2/PO1	EFF-AD ROTOR %	EFF-P ROTOR %
1.1336	1.4849	89.52	90.09

TABLE XVI (Cont'd)

AERODYNAMIC SUMMARY – ROTOR 1
(English Units)

RUN NO   O, SPEED CODE   O, POINT NO   O

SL	EPSI-1 DEGREE	EPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	V0-1 FT/SEC	V0-2 FT/SEC	P-1 DEGREE	B-2 DEGREE	M-1	M-2	U-1 FT/SEC	U-2 FT/SEC	M'-1	M'-2	V'-1 FT/SEC	V'-2 FT/SEC
1	12.666	11.135	703.6	1060.6	703.6	607.4	0.0	869.4	0.0	55.0	0.6567	0.9656	480.4	533.0	0.7952	0.6322	851.9	694.4
2	12.175	9.481	707.7	1001.2	707.7	645.7	0.0	765.2	0.0	49.7	0.6609	0.9068	516.6	566.4	0.8183	0.6119	876.2	675.6
3	11.371	8.133	711.6	952.6	711.6	650.6	0.0	695.8	0.0	46.8	0.6648	0.8584	554.3	599.8	0.8427	0.5926	902.0	657.6
4	10.416	7.044	715.2	911.6	715.2	646.5	0.0	642.7	0.0	44.7	0.6685	0.8177	592.5	633.2	0.8661	0.5800	928.7	646.5
5	9.424	6.148	718.3	876.8	718.3	636.9	0.0	602.6	0.0	43.3	0.6717	0.7833	630.8	666.6	0.8939	0.5718	955.9	640.1
6	7.554	4.704	722.7	819.3	722.7	617.9	0.0	537.9	0.0	41.0	0.6762	0.7271	706.1	733.3	0.9453	0.5751	1010.4	648.1
7	5.839	3.657	725.7	775.5	725.5	600.8	0.0	490.6	0.0	39.2	0.6786	0.6847	780.5	800.6	0.9970	0.5969	1065.3	676.0
8	4.353	2.801	725.7	742.0	725.7	588.2	0.0	452.3	0.0	37.5	0.6792	0.6526	853.4	867.3	1.0485	0.6331	1120.2	719.9
9	3.086	2.043	725.0	717.7	725.0	579.2	0.0	423.8	0.0	36.2	0.6785	0.6291	924.3	933.4	1.0994	0.6763	1174.7	771.5
10	2.494	1.679	724.6	707.2	724.6	575.4	0.0	411.2	0.0	35.5	0.6781	0.6191	960.1	967.1	1.1257	0.7003	1202.9	800.1
11	1.933	1.321	724.4	698.4	724.4	572.1	0.0	400.5	0.0	35.0	0.6779	0.6105	995.6	1000.5	1.1522	0.7247	1231.2	829.1
12	0.924	0.640	723.2	684.5	723.2	564.6	0.0	387.1	0.0	34.4	0.6767	0.5963	1065.8	1067.3	1.2052	0.7701	1288.0	884.0
13	0.493	0.340	722.2	679.3	722.2	560.4	0.0	383.9	0.0	34.4	0.6757	0.5906	1100.7	1100.9	1.2317	0.7912	1316.5	910.0
14	0.152	0.105	721.2	678.7	721.2	549.6	0.0	398.3	0.0	35.9	0.6746	0.5875	1135.0	1134.3	1.2579	0.7951	1344.7	918.6
15	-0.031	-0.023	720.2	678.1	720.2	536.7	0.0	414.6	0.0	37.7	0.6737	0.5841	1168.5	1167.7	1.2839	0.7966	1372.6	924.8
16	0.000	-0.000	719.8	684.3	719.8	518.5	0.0	446.6	0.3	40.7	0.6732	0.5853	1201.0	1201.0	1.3095	0.7830	1400.2	915.4

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1	%EFF-P TOT	%EFF-A TOT	B'-1 DEGREE	B'-2 DEGREE	V0'-1 FT/SEC	V0'-2 FT/SEC	PO/PO INLET
1	-3.81	1.82	13.45	62.34	43.76	40.22	0.4215	0.1850	0.0357	1.5250	86.96	86.16	34.41	-28.92	-480.4	336.4	1.5250
2	-2.32	3.24	14.99	53.26	43.90	44.97	0.4396	0.1091	0.0243	1.5180	91.56	91.05	36.23	-17.03	-516.6	198.8	1.5180
3	-1.77	3.70	15.73	46.39	44.04	47.02	0.4642	0.0743	0.0180	1.5110	93.81	93.44	38.04	-8.35	-554.3	96.0	1.5110
4	-1.39	3.99	15.61	40.60	44.16	48.09	0.4837	0.0546	0.0141	1.5050	94.85	94.85	39.75	-0.84	-592.5	9.6	1.5050
5	-1.02	4.29	15.41	35.68	44.26	48.46	0.5001	0.0476	0.0128	1.5000	95.53	95.26	41.39	5.71	-630.8	-64.0	1.5000
6	-0.56	4.61	13.96	26.91	44.41	48.63	0.5121	0.0418	0.0117	1.4905	95.66	95.41	44.41	17.50	-706.1	-195.4	1.4905
7	-0.56	4.35	11.18	19.90	44.49	48.39	0.5070	0.0444	0.0124	1.4837	95.00	94.71	47.15	27.26	-780.5	-310.0	1.4837
8	-0.96	3.66	8.37	14.46	44.51	48.17	0.4893	0.0473	0.0130	1.4790	93.96	93.96	49.65	35.19	-853.4	-415.1	1.4790
9	-0.85	3.27	7.03	10.57	44.49	47.99	0.4681	0.0530	0.0142	1.4770	93.23	92.84	51.91	41.34	-924.3	-509.6	1.4770
10	-0.20	3.18	6.52	8.96	44.48	47.89	0.4565	0.0563	0.0149	1.4760	92.62	92.20	52.97	44.01	-960.1	-555.9	1.4760
11	0.62	3.16	6.39	7.61	44.47	47.80	0.4456	0.0605	0.0158	1.4756	91.87	91.41	53.97	46.36	-995.6	-600.0	1.4756
12	1.22	3.46	6.19	5.53	44.43	47.37	0.4294	0.0776	0.0198	1.4753	89.24	88.64	55.84	50.31	-1065.8	-680.2	1.4753
13	1.44	3.66	6.11	4.74	44.40	47.04	0.4240	0.0905	0.0229	1.4755	87.37	86.66	56.73	51.99	-1100.7	-717.0	1.4755
14	1.58	2.80	6.68	4.32	44.36	45.93	0.4367	0.1288	0.0324	1.4783	82.68	81.49	57.57	53.25	-1135.0	-736.1	1.4783
15	1.43	3.65	8.32	3.82	44.33	44.61	0.4514	0.1687	0.0422	1.4811	77.71	76.44	58.35	54.53	-1168.5	-753.2	1.4811
16	1.03	3.24	11.80	3.57	44.32	42.72	0.4815	0.2258	0.0565	1.4901	71.74	70.12	59.07	55.50	-1201.0	-754.4	1.4901

TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	WC1/A1 INLET LBM/SEC SQFT
1.1336	1.4849	89.52	90.09	42.85

TO2/TO1	PO2/PO1	EFF-AD ROTOR %	EFF-P ROTOR %
1.1336	1.4849	89.52	90.09

TABLE XVII

AERODYNAMIC SUMMARY – STATOR 1
(SI Units)

RUN NO O, POINT NO 0, SPEED CODE O2 POINT NO 0

SL	EPSI-1 RADIAN	EPSI-2 RADIAN	V-1 M/SEC	V-2 M/SEC	VM-2 M/SEC	VM-1 M/SEC	VØ-1 M/SEC	VØ-2 M/SEC	B-1 RADIAN	B-2 RADIAN	M-1	M-2	TO/TO INLET	PO/PO INLET	TO2/TO1	PO/PO STAGE	%EFF-A TOT-INLET	%EFF-P TOT-INLET	%EFF-A TOT-STG	%EFF-P TOT-STG
1	0.2738	0.1833	287.0	182.8	181.3	141.2	249.9	23.5	1.0546	0.1255	0.8410	0.5145	1.1487	1.4181	1.1487	1.4181	70.57	71.98	70.57	71.98
2	0.2037	0.1404	275.7	181.1	179.5	165.3	220.6	23.4	0.9265	0.1279	0.8071	0.5115	1.1391	1.4356	1.1391	1.4356	78.25	79.33	78.25	79.33
3	0.1603	0.1141	267.3	181.0	179.4	175.8	201.4	23.5	0.8526	0.1291	0.7816	0.5125	1.1340	1.4517	1.1340	1.4517	83.89	84.71	83.89	84.71
4	0.1289	0.0950	260.4	179.9	178.3	181.5	186.8	23.4	0.7998	0.1298	0.7604	0.5100	1.1306	1.4603	1.1306	1.4603	87.46	88.12	87.46	88.12
5	0.1065	0.0813	254.6	179.2	177.7	184.1	175.9	23.3	0.7626	0.1301	0.7420	0.5084	1.1290	1.4665	1.1290	1.4665	89.66	90.20	89.66	90.20
6	0.0724	0.0612	244.1	177.2	175.7	185.9	158.2	23.1	0.7053	0.1306	0.7091	0.5030	1.1266	1.4700	1.1266	1.4700	91.91	92.34	91.91	92.34
7	0.0507	0.0478	235.4	175.8	174.3	185.3	145.3	22.9	0.6651	0.1307	0.6817	0.4989	1.1260	1.4689	1.1260	1.4689	92.18	92.59	92.18	92.59
8	0.0367	0.0380	228.3	174.9	173.4	184.2	134.9	22.8	0.6321	0.1308	0.6591	0.4964	1.1259	1.4670	1.1259	1.4670	91.89	92.32	91.89	92.32
9	0.0269	0.0304	222.8	174.6	173.1	183.0	127.1	22.8	0.6068	0.1309	0.6417	0.4952	1.1270	1.4657	1.1270	1.4657	90.91	91.39	90.91	91.39
10	0.0232	0.0270	220.4	174.2	172.7	182.4	123.6	22.7	0.5954	0.1309	0.6339	0.4938	1.1277	1.4643	1.1277	1.4643	90.21	90.72	90.21	90.72
11	0.0200	0.0238	218.3	173.8	172.4	181.9	120.7	22.7	0.5858	0.1309	0.6272	0.4925	1.1286	1.4633	1.1286	1.4633	89.34	89.89	89.34	89.89
12	0.0143	0.0177	214.9	172.6	171.1	180.2	117.1	22.5	0.5762	0.1309	0.6157	0.4879	1.1326	1.4598	1.1326	1.4598	86.09	86.81	86.09	86.81
13	0.0118	0.0148	213.6	171.4	170.0	179.2	116.4	22.4	0.5761	0.1309	0.6108	0.4838	1.1357	1.4567	1.1357	1.4567	83.64	84.49	83.64	84.49
14	0.0090	0.0112	213.7	171.6	170.1	176.2	121.0	22.4	0.6017	0.1309	0.6083	0.4821	1.1450	1.4560	1.1450	1.4560	78.15	79.28	78.15	79.28
15	0.0053	0.0065	213.8	170.4	169.4	172.6	126.1	22.3	0.6311	0.1309	0.6056	0.4779	1.1554	1.4530	1.1554	1.4530	72.50	73.91	72.50	73.91
16	-0.0000	0.0000	215.8	173.0	171.5	167.5	136.1	22.6	0.6824	0.1309	0.6071	0.4804	1.1721	1.4556	1.1721	1.4556	65.78	67.53	65.78	67.53

SL	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1	%EFF-P STATC-ST
1	0.0212	0.0968	0.2807	0.9291	33.79	49.37	0.5152	0.1892	0.0376	0.9299	74.27
2	-0.0096	0.0718	0.2311	0.7986	40.71	49.98	0.4883	0.1556	0.0323	0.9457	77.69
3	-0.0067	0.0796	0.1879	0.7236	44.06	50.72	0.4644	0.1182	0.0256	0.9607	82.14
4	-0.0160	0.0742	0.1672	0.6698	46.11	50.91	0.4487	0.0934	0.0211	0.9703	85.31
5	-0.0323	0.0612	0.1586	0.6325	47.26	51.06	0.4347	0.0730	0.0171	0.9777	88.05
6	-0.0562	0.0436	0.1457	0.5747	48.56	50.85	0.4122	0.0483	0.0102	0.9862	91.45
7	-0.0807	0.0252	0.1395	0.5344	49.05	50.52	0.3926	0.0372	0.0101	0.9900	92.87
8	-0.1051	0.0066	0.1341	0.5013	49.29	50.28	0.3739	0.0321	0.0093	0.9919	93.32
9	-0.1285	-0.0110	0.1278	0.4760	49.38	50.12	0.3584	0.0316	0.0097	0.9924	92.91
10	-0.1407	-0.0202	0.1257	0.4646	49.39	49.96	0.3527	0.0334	0.0105	0.9921	92.26
11	-0.1524	-0.0290	0.1241	0.4549	49.38	49.81	0.3480	0.0359	0.0116	0.9917	91.47
12	-0.1746	-0.0458	0.1231	0.4453	49.08	49.26	0.3465	0.0467	0.0159	0.9895	84.51
13	-0.1890	-0.0577	0.1249	0.4452	48.79	48.79	0.3510	0.0572	0.0199	0.9873	85.94
14	-0.1989	-0.0656	0.1347	0.4708	47.75	48.44	0.3622	0.0681	0.0243	0.9849	83.18
15	-0.2108	-0.0760	0.1711	0.5062	46.51	47.82	0.3785	0.0867	0.0316	0.9810	78.86
16	-0.2180	-0.0821	0.2321	0.5515	44.73	47.74	0.3960	0.1050	0.0391	0.9769	74.18

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	TO2/TO1	PO2/PO1	EFF-AD STAGE %	EFF-P TOT-STG %
876.19	96.372	1.1336	1.4611	85.66	86.41	1.1336	0.9840	85.66	261.44

TABLE XVII (Cont'd)

AERODYNAMIC SUMMARY – STATOR 1
(English Units)

RUN NO   SPEED CODE   POINT NO 0

SL	EPSI-1 DEGREE	EPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VØ-1 FT/SEC	VØ-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	M-1	M-2	PO/PO INLET	TO/TO INLET	PO/PO STAGE	TO2/TO1
1	15.687	10.500	941.8	599.8	463.3	594.9	820.0	77.0	60.4	7.2	0.8410	0.5145	1.4181	1.1487	1.4181	1.1487
2	11.672	8.046	904.4	594.0	542.4	589.0	723.7	76.8	53.1	7.3	0.8071	0.5115	1.4356	1.1391	1.4356	1.1391
3	9.183	6.539	877.1	593.8	576.7	588.8	660.8	77.0	48.9	7.4	0.7816	0.5125	1.4517	1.1340	1.4517	1.1340
4	7.388	5.441	854.5	590.1	595.4	585.1	612.9	76.7	45.8	7.4	0.7604	0.5100	1.4603	1.1306	1.4603	1.1306
5	6.099	4.659	835.3	587.9	603.9	582.9	577.1	76.5	43.7	7.5	0.7420	0.5084	1.4665	1.1290	1.4665	1.1290
6	4.150	3.504	800.9	581.4	609.9	576.5	519.2	75.8	40.4	7.5	0.7091	0.5030	1.4700	1.1266	1.4700	1.1266
7	2.903	2.736	772.4	576.7	607.8	571.8	476.7	75.2	38.1	7.5	0.6817	0.4989	1.4689	1.1260	1.4689	1.1260
8	2.101	2.178	748.9	574.0	604.2	569.1	442.5	74.9	36.2	7.5	0.6591	0.4964	1.4670	1.1259	1.4670	1.1259
9	1.540	1.741	731.0	572.0	600.5	568.0	416.9	74.7	34.8	7.5	0.6417	0.4952	1.4657	1.1270	1.4657	1.1270
10	1.326	1.546	723.0	571.5	598.5	566.6	405.5	74.6	34.1	7.5	0.6339	0.4938	1.4643	1.1277	1.4643	1.1277
11	1.148	1.363	716.2	570.4	596.8	565.5	395.9	74.4	33.6	7.5	0.6272	0.4925	1.4633	1.1286	1.4633	1.1286
12	0.822	1.017	705.3	566.2	591.4	561.4	384.3	73.9	33.0	7.5	0.6157	0.4879	1.4598	1.1326	1.4598	1.1326
13	0.679	0.847	701.0	562.4	587.8	557.6	381.9	73.4	33.0	7.5	0.6108	0.4838	1.4567	1.1357	1.4567	1.1357
14	0.516	0.643	701.2	562.9	578.0	558.0	396.9	73.5	34.5	7.5	0.6083	0.4821	1.4560	1.1450	1.4560	1.1450
15	0.305	0.372	701.3	560.7	566.2	555.9	413.8	73.2	36.2	7.5	0.6056	0.4779	1.4530	1.1554	1.4530	1.1554
16	-0.000	-0.000	708.1	567.6	549.6	562.7	446.6	74.1	39.1	7.5	0.6071	0.4804	1.4556	1.1721	1.4556	1.1721

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1	%EFF-P STATC-ST	%EFF-A TOT-INLET	%EFF-P TOT-INLET	%EFF-A TOT-STG	%EFF-P TOT-STG
1	1.21	5.54	16.08	53.23	33.79	49.37	0.5152	0.1892	0.0376	0.9299	74.27	70.57	71.98	70.57	71.98
2	-0.55	4.11	13.24	45.75	40.71	49.98	0.4883	0.1556	0.0323	0.9457	77.69	78.25	79.33	78.25	79.33
3	-0.38	4.56	10.77	41.46	44.06	50.72	0.4644	0.1182	0.0256	0.9607	82.14	83.89	84.71	83.89	84.71
4	-0.92	4.25	9.58	38.38	46.11	50.91	0.4487	0.0934	0.0211	0.9703	85.31	87.46	88.12	87.46	88.12
5	-1.85	3.50	9.09	36.24	47.26	51.06	0.4347	0.0730	0.0171	0.9777	88.05	89.66	90.20	89.66	90.20
6	-3.22	2.50	8.35	32.93	48.56	50.85	0.4122	0.0483	0.0122	0.9862	91.45	91.91	92.34	91.91	92.34
7	-4.62	1.44	7.99	30.62	49.05	50.52	0.3926	0.0372	0.0101	0.9900	92.87	92.18	92.59	92.18	92.59
8	-6.02	0.38	7.68	28.72	49.29	50.28	0.3739	0.0321	0.0093	0.9919	93.32	91.89	92.32	91.89	92.32
9	-7.36	-0.63	7.32	27.27	49.38	50.12	0.3584	0.0316	0.0097	0.9924	92.91	90.91	91.39	90.91	91.39
10	-8.06	-1.16	7.20	26.62	49.39	49.96	0.3527	0.0334	0.0105	0.9921	92.26	90.21	90.72	90.21	90.72
11	-8.73	-1.66	7.11	26.06	49.38	49.81	0.3480	0.0359	0.0116	0.9917	91.47	89.34	89.89	89.34	89.89
12	-10.00	-2.62	7.05	25.51	49.08	49.26	0.3465	0.0467	0.0159	0.9895	86.51	86.09	86.81	86.09	86.81
13	-10.83	-3.31	7.16	25.51	48.79	48.79	0.3510	0.0572	0.0199	0.9873	85.94	83.64	84.49	83.64	84.49
14	-11.40	-3.76	7.72	25.97	47.75	48.44	0.3622	0.0681	0.0243	0.9849	83.18	78.15	79.28	78.15	79.28
15	-12.08	-4.35	9.80	23.66	46.51	47.82	0.3785	0.0867	0.0316	0.9810	78.86	72.50	73.91	72.50	73.91
16	-12.49	-4.70	13.30	31.60	44.73	47.74	0.3960	0.1050	0.0391	0.9769	74.18	65.78	67.53	65.78	67.53

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	TO2/TO1	PO2/PO1	EFF-AD STAGE %	EFF-P TOT-STG %
8367.	212.50	1.1336	1.4611	85.66	86.41	1.1336	0.9840	85.66	261.44

TABLE XVIII

AERODYNAMIC SUMMARY – ROTOR 2
(SI Units)

SL	FPSI-1 RADIAN	EPSI-2 RADIAN	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VØ-1 M/SEC	VØ-2 M/SEC	B-1 RADIAN	B-2 RADIAN	M-1	M-2 (RUN NO)	U-1 M/SEC	U-2 M/SEC (SPEED CODE)	VØ'-1 M/SEC	VØ'-2 M/SEC	M'-1	M'-2 (POINT NO)	V'-1 M/SEC	V'-2 M/SEC
1	0.1895	0.1269	149.8	268.6	148.1	184.5	22.9	195.3	0.1521	0.8050	0.4180	0.7378	187.9	203.4	-165.0	-8.1	0.6186	0.5072	221.7	184.7
2	0.1638	0.1138	161.0	260.1	159.4	186.4	22.7	181.4	0.1409	0.7654	0.4523	0.7169	196.4	209.7	-173.7	-28.3	0.6623	0.5197	235.7	188.6
3	0.1429	0.1017	170.5	251.8	169.0	187.9	22.8	167.7	0.1335	0.7240	0.4814	0.6953	205.1	216.4	-182.3	-48.8	0.7019	0.5360	248.6	194.1
4	0.1255	0.0906	176.4	244.3	174.9	186.9	22.8	157.3	0.1287	0.6963	0.4996	0.6750	213.9	223.4	-191.1	-66.2	0.7339	0.5478	259.1	198.3
5	0.1106	0.0805	180.8	238.7	179.4	185.5	22.7	150.2	0.1255	0.6783	0.5132	0.6594	222.6	230.7	-199.9	-80.5	0.7624	0.5586	268.6	202.2
6	0.0844	0.0614	185.0	227.4	183.7	180.4	22.5	139.3	0.1211	0.6567	0.5264	0.6286	240.2	245.6	-217.6	-106.3	0.8102	0.5775	284.8	209.4
7	0.0621	0.0447	186.2	218.4	184.8	174.6	22.5	131.2	0.1211	0.6438	0.5290	0.6009	257.9	261.4	-235.4	-130.2	0.8520	0.5993	299.3	217.8
8	0.0427	0.0294	185.8	210.2	184.5	169.7	22.5	124.0	0.1214	0.6311	0.5290	0.5770	275.7	277.6	-253.3	-153.6	0.8919	0.6284	313.3	228.9
9	0.0262	0.0160	185.0	203.4	183.6	165.8	22.5	117.8	0.1222	0.6178	0.5262	0.5570	293.5	294.2	-270.9	-176.4	0.9309	0.6631	327.3	242.1
10	0.0185	0.0098	184.1	199.9	182.8	163.7	22.5	114.8	0.1227	0.6115	0.5235	0.5470	302.5	302.9	-280.0	-188.1	0.9506	0.6821	334.4	249.3
11	0.0113	0.0039	183.3	196.9	181.4	161.9	22.5	111.9	0.1232	0.6049	0.5208	0.5379	311.6	311.5	-289.6	-199.6	0.9703	0.7023	341.6	257.0
12	-0.0008	-0.0065	181.0	190.9	178.0	158.2	22.4	106.8	0.1242	0.5936	0.5130	0.5199	329.8	329.2	-307.4	-222.4	1.0089	0.7434	356.0	273.0
13	-0.0052	-0.0101	179.4	187.6	177.7	154.5	22.3	106.0	0.1247	0.6051	0.5074	0.5099	339.0	338.3	-316.7	-231.4	1.0275	0.7552	363.3	278.2
14	-0.0069	-0.0107	179.1	186.3	179.1	150.3	22.3	110.0	0.1251	0.6317	0.5043	0.5021	348.2	347.5	-325.8	-237.4	1.0450	0.7574	371.1	281.0
15	-0.0052	-0.0073	178.2	186.9	176.8	146.7	22.3	115.9	0.1254	0.6687	0.4992	0.4996	357.2	356.8	-334.9	-240.9	1.0611	0.7537	378.2	282.0
16	0.0000	0.0000	180.1	190.9	178.7	145.4	22.6	123.7	0.1257	0.7050	0.5011	0.5047	366.0	366.0	-343.5	-242.3	1.0772	0.7472	387.2	282.6

SL	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/POI	%EFF-P TOT	%EFF-A TOT	B'-1 RADIAN	B'-2 RADIAN	VØ'-1 M/SEC	VØ'-2 M/SEC	PO/PO INLET
1	-0.1009	0.0280	0.2652	0.7926	42.09	55.47	0.3576	0.1124	0.0262	1.3901	92.91	92.57	0.8359	0.0432	-165.0	-8.1	1.9713
2	-0.0848	0.0378	0.2506	0.6768	45.59	57.55	0.3695	0.0892	0.0213	1.3733	93.41	93.11	0.8255	0.1487	-173.7	-28.3	1.9715
3	-0.0778	0.0385	0.2321	0.5695	48.47	59.24	0.3703	0.0651	0.0158	1.3553	94.42	94.16	0.8213	0.2517	-182.3	-48.8	1.9711
4	-0.0684	0.0419	0.2086	0.4901	50.19	59.90	0.3734	0.0495	0.0121	1.3435	95.27	95.06	0.8283	0.3381	-191.1	-66.2	1.9675
5	-0.0649	0.0397	0.1960	0.4311	51.43	60.21	0.3775	0.0410	0.0101	1.3374	95.74	95.56	0.8386	0.4076	-199.9	-80.5	1.9619
6	-0.0516	0.0420	0.1689	0.3379	52.55	59.61	0.3841	0.0355	0.0088	1.3286	95.83	95.66	0.8696	0.5317	-217.6	-106.3	1.9613
7	-0.0423	0.0409	0.1395	0.2651	52.77	58.39	0.3841	0.0373	0.0092	1.3222	95.20	95.01	0.9054	0.6403	-235.4	-130.2	1.9530
8	-0.0271	0.0466	0.1188	0.2058	52.63	57.22	0.3751	0.0395	0.0095	1.3166	94.52	94.30	0.9414	0.7356	-253.3	-153.6	1.9422
9	-0.0077	0.0569	0.1146	0.1588	52.37	56.20	0.3605	0.0416	0.0098	1.3111	93.79	93.54	0.9753	0.8165	-270.9	-176.4	1.9314
10	0.0047	0.0602	0.1101	0.1381	52.11	55.60	0.3520	0.0428	0.0100	1.3083	93.39	93.13	0.9926	0.8545	-280.0	-188.1	1.9217
11	0.0187	0.0621	0.1086	0.1199	51.86	55.06	0.3427	0.0436	0.0100	1.3055	93.03	92.76	1.0091	0.8892	-289.6	-199.6	1.9157
12	0.0283	0.0670	0.1102	0.0894	51.10	53.78	0.3241	0.0459	0.0102	1.3001	92.21	91.91	1.0419	0.9525	-307.4	-222.4	1.9103
13	0.0330	0.0718	0.1135	0.0766	50.53	52.29	0.3257	0.0639	0.0140	1.2973	89.12	88.71	1.0587	0.9821	-316.7	-231.4	1.8979
14	0.0369	0.0758	0.1174	0.0652	50.08	50.30	0.3381	0.0970	0.0211	1.2944	83.84	83.23	1.0715	1.0063	-325.8	-237.4	1.8898
15	0.0404	0.0793	0.1239	0.0613	49.40	48.39	0.3578	0.1364	0.0296	1.2986	78.30	77.57	1.0851	1.0238	-334.9	-240.9	1.8868
16	0.0318	0.0708	0.1596	0.0607	49.26	47.10	0.3810	0.1773	0.0390	1.3051	73.42	72.39	1.0911	1.0304	-343.5	-242.3	1.8997

TO/TC INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	WC1/A1 KG/SEC SQM
1.2354	1.9242	87.28	88.39	173.80

TO2/TO1	PO2/PO1	EFF-AD ROTOR %	EFF-P ROTOR %
1.0898	1.3170	90.92	91.27

TABLE XVIII (Cont'd)

AERODYNAMIC SUMMARY – ROTOR 2
(English Units)

RUN NO 0, SPEED CODE 0, POINT NO 0

SL	EPSI-1 DEGREE	EPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VΘ-1 FT/SEC	VΘ-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	M-1	M-2	U-1 FT/SEC	U-2 FT/SEC	M'-1	M'-2	V'-1 FT/SEC	V'-2 FT/SEC
1	10.858	7.269	491.6	881.4	485.8	605.4	75.0	640.7	8.7	46.1	0.4180	0.7378	616.6	667.3	0.6186	0.5072	727.5	606.0
2	9.385	6.522	528.2	853.4	522.9	611.7	74.6	595.2	8.1	43.9	0.4523	0.7169	644.5	688.0	0.6623	0.5197	773.4	618.7
3	8.190	5.829	559.5	826.1	554.4	616.4	74.8	550.1	7.6	41.5	0.4814	0.6953	673.0	710.1	0.7019	0.5360	815.6	636.8
4	7.188	5.193	578.7	801.4	573.9	613.2	74.5	516.0	7.4	39.9	0.4996	0.6750	701.7	733.1	0.7339	0.5478	850.1	650.5
5	6.335	4.611	593.2	783.2	588.5	608.7	74.4	492.8	7.2	38.5	0.5132	0.6594	730.4	756.8	0.7624	0.5586	881.3	663.5
6	4.838	3.516	607.1	747.7	602.6	591.8	74.0	457.1	7.0	37.6	0.5264	0.6286	788.1	805.9	0.8102	0.5775	934.4	686.9
7	3.558	2.559	610.8	716.5	606.3	572.9	73.8	430.3	6.9	36.9	0.5300	0.6009	846.2	857.5	0.8520	0.5993	982.0	714.7
8	2.448	1.687	609.7	689.7	605.2	556.8	73.8	407.0	7.0	36.2	0.5290	0.5770	904.7	911.0	0.8919	0.6284	1028.0	751.0
9	1.499	0.916	606.4	667.3	602.4	543.9	74.0	386.5	7.0	35.4	0.5262	0.5570	962.8	965.4	0.9309	0.6631	1073.8	794.3
10	1.058	0.563	604.2	656.0	599.6	537.1	73.9	376.6	7.0	35.0	0.5235	0.5470	992.6	993.7	0.9506	0.6821	1097.1	818.1
11	0.647	0.225	601.4	645.9	596.9	531.3	73.6	367.3	7.1	34.7	0.5208	0.5379	1022.4	1022.2	0.9703	0.7023	1120.7	843.3
12	-0.048	-0.374	594.0	626.6	589.4	519.1	73.6	350.3	7.1	34.0	0.5130	0.5199	1082.1	1080.1	1.0089	0.7434	1168.1	895.6
13	-0.298	-0.577	588.6	616.3	584.0	506.9	73.2	350.6	7.1	34.7	0.5074	0.5099	1112.3	1109.8	1.0275	0.7552	1192.0	912.8
14	-0.398	-0.611	587.6	611.2	583.0	493.2	73.3	361.0	7.2	36.2	0.5043	0.5021	1142.3	1140.0	1.0450	0.7574	1217.6	922.0
15	-0.297	-0.418	584.6	613.3	580.0	481.2	73.1	380.3	7.2	38.3	0.4992	0.4996	1172.0	1170.5	1.0611	0.7537	1242.5	925.2
16	0.000	0.000	590.9	626.3	586.2	477.1	74.1	405.9	7.2	40.4	0.5011	0.5047	1201.0	1201.0	1.0772	0.7472	1270.3	927.2

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1	%EFF-P TOT	%EFF-A TOT	B'-1 DEGREE	B'-2 DEGREE	VΘ'-1 FT/SEC	VΘ'-2 FT/SEC	PO/PO INLET
1	-5.76	1.60	15.20	45.41	42.04	55.47	0.3576	0.1124	0.0262	1.3001	92.91	92.57	47.89	2.48	-541.5	-26.6	1.9713
2	-4.86	2.17	14.36	38.78	45.50	57.55	0.3695	0.0892	0.0213	1.3733	93.41	93.11	47.30	8.52	-569.9	-92.8	1.9715
3	-4.46	2.21	13.30	32.63	48.47	59.24	0.3703	0.0651	0.0158	1.3553	94.42	94.16	47.06	14.42	-598.2	-160.0	1.9675
4	-3.92	2.40	11.95	28.08	50.19	59.90	0.3734	0.0495	0.0121	1.3435	95.27	95.06	47.46	19.37	-627.2	-217.1	1.9619
5	-3.72	2.28	11.35	24.70	51.43	60.21	0.3775	0.0410	0.0101	1.3374	95.74	95.56	48.05	23.35	-656.0	-264.0	1.9613
6	-2.96	2.40	9.68	19.36	52.55	59.61	0.3841	0.0355	0.0088	1.3286	95.83	95.66	49.83	30.47	-714.1	-348.9	1.9530
7	-2.43	2.35	7.99	15.19	52.77	58.39	0.3841	0.0373	0.0092	1.3222	95.20	95.01	51.87	36.69	-772.5	-427.2	1.9422
8	-1.55	2.47	6.81	11.70	52.63	57.22	0.3751	0.0395	0.0095	1.3166	94.52	94.30	53.94	42.15	-830.9	-504.0	1.9314
9	-0.44	3.26	6.57	9.10	52.37	56.20	0.3605	0.0416	0.0098	1.3111	93.79	93.54	55.88	46.78	-888.9	-578.9	1.9217
10	0.27	3.45	6.26	7.91	52.11	55.60	0.3520	0.0428	0.0100	1.3083	93.39	93.13	56.87	48.96	-918.7	-617.0	1.9157
11	1.07	3.56	6.31	6.87	51.86	55.06	0.3427	0.0436	0.0100	1.3055	93.03	92.76	57.82	50.95	-948.5	-654.9	1.9103
12	1.62	3.84	6.22	6.12	51.10	53.78	0.3241	0.0459	0.0102	1.3001	92.21	91.91	59.70	54.57	-1008.5	-729.8	1.8979
13	1.89	4.11	6.32	4.39	50.53	52.29	0.3257	0.0639	0.0140	1.2973	89.12	88.71	60.66	56.27	-1039.1	-759.2	1.8898
14	2.11	4.35	6.51	3.73	50.08	50.31	0.3381	0.0970	0.0211	1.2944	83.84	83.23	61.39	57.66	-1069.0	-779.0	1.8847
15	2.31	4.54	6.73	3.51	49.40	48.39	0.3578	0.1364	0.0296	1.2986	78.39	77.57	62.17	58.66	-1098.9	-790.2	1.8868
16	1.82	4.06	9.15	2.48	49.26	47.10	0.3810	0.1773	0.0390	1.3051	73.42	72.39	62.52	59.04	-1126.9	-795.1	1.8997

TC/TC INLET	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	WC1/A1 INLET LBM/SEC SQFT
1.2354	1.9242	87.28	88.39	35.62

TC2/TC1	PO2/PO1	TO2/TO1	EFF-AD ROTOR %	EFF-P ROTOR %
1.0898	1.3170		90.92	91.27

TABLE XIX

AERODYNAMIC SUMMARY – STATOR 2
(SI Units)

RUN NO   O₂ SPEED CODE   O₂ POINT NO 0

SL	EPSI-1 RADIAN	EPSI-2 RADIAN	V-1 M/SEC	V-2 M/SEC	VM-1 M/SEC	VM-2 M/SEC	VΘ-1 M/SEC	VΘ-2 M/SEC	B-1 RADIAN	B-2 RADIAN	M-1	M-2	PO/PO INLET	TO/TO INLET	PO/PO STAGE	TO2/TO1
1	0.1439	0.1717	240.9	173.2	144.9	173.2	192.4	0.0	0.9200	0.0000	0.6545	0.4613	1.8694	1.2708	1.3182	1.1063
2	0.1237	0.1450	237.2	176.7	156.6	176.7	178.2	0.0	0.8458	0.0000	0.6482	0.4742	1.8923	1.2549	1.3181	1.1016
3	0.1072	0.1226	233.6	179.5	166.1	179.5	164.4	0.0	0.7777	0.0000	0.6409	0.4842	1.9121	1.2430	1.3171	1.0961
4	0.0933	0.1037	230.4	179.9	171.3	179.9	154.1	0.0	0.7306	0.0000	0.6335	0.4871	1.9227	1.2351	1.3167	1.0924
5	0.0814	0.0878	226.7	179.9	175.1	179.9	147.1	0.0	0.6978	0.0000	0.6294	0.4880	1.9302	1.2311	1.3162	1.0904
6	0.0613	0.0619	223.7	177.4	177.2	177.4	136.6	0.0	0.6544	0.0000	0.6161	0.4819	1.9329	1.2260	1.3149	1.0882
7	0.0455	0.0426	218.0	173.6	175.8	173.6	128.9	0.0	0.6325	0.0000	0.5998	0.4716	1.9273	1.2242	1.3121	1.0872
8	0.0329	0.0283	212.0	169.7	173.2	169.7	122.3	0.0	0.6146	0.0000	0.5822	0.4606	1.9185	1.2233	1.3078	1.0865
9	0.0230	0.0102	206.2	166.0	170.1	166.0	116.5	0.0	0.6004	0.0000	0.5652	0.4500	1.9085	1.2237	1.3021	1.0858
10	0.0189	0.0142	203.0	163.7	168.1	163.7	113.7	0.0	0.5946	0.0000	0.5557	0.4436	1.9018	1.2241	1.2987	1.0855
11	0.0155	0.0111	199.9	161.5	166.2	161.5	111.0	0.0	0.5889	0.0000	0.5467	0.4371	1.8948	1.2247	1.2949	1.0851
12	0.0102	0.0069	193.7	156.4	162.0	156.4	106.2	0.0	0.5803	0.0000	0.5280	0.4224	1.8792	1.2283	1.2873	1.0845
13	0.0081	0.0055	190.5	153.2	158.0	153.2	106.5	0.0	0.5929	0.0000	0.5175	0.4122	1.8687	1.2343	1.2828	1.0868
14	0.0056	0.0038	188.8	151.1	153.7	151.1	109.7	0.0	0.6201	0.0000	0.5093	0.4038	1.8601	1.2500	1.2775	1.0917
15	0.0027	0.0017	189.3	147.9	149.8	147.9	115.8	0.0	0.6578	0.0000	0.5063	0.3917	1.8481	1.2705	1.2719	1.0996
16	-0.0000	0.0000	193.4	147.2	148.6	147.2	123.7	0.0	0.6941	0.0000	0.5116	0.3853	1.8416	1.2996	1.2651	1.1088

SL	INCS RADIAN	INCM RADIAN	DEV RADIAN	TURN RADIAN	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1	%EFF-P STATIC-ST	%EFF-A TOT-INLET	%EFF-P TOT-INLET	%EFF-A TOT-STG	%EFF-P TOT-STG
1	-0.6508	-0.0566	0.1702	0.9200	45.91	57.61	0.4399	0.2068	0.0420	0.9483	62.49	72.18	74.50	77.06	77.94
2	-0.7250	-0.0535	0.1566	0.8458	56.47	59.91	0.4100	0.1634	0.0343	0.9598	67.99	78.34	80.18	80.59	81.34
3	-0.7931	-0.0553	0.1419	0.7777	54.14	61.77	0.3823	0.1167	0.0253	0.9718	75.29	83.65	85.06	84.97	85.54
4	-0.8402	-0.0402	0.1404	0.7306	56.31	62.59	0.3672	0.0843	0.0189	0.9800	81.26	87.28	88.39	88.32	88.76
5	-0.8730	-0.0530	0.1423	0.6978	57.84	63.01	0.3605	0.0677	0.0156	0.9842	84.59	89.39	90.32	90.10	90.48
6	-0.9144	-0.0687	0.1469	0.6544	58.96	62.66	0.3561	0.0455	0.0112	0.9897	89.31	91.61	92.34	92.05	92.35
7	-0.9383	-0.0663	0.1514	0.6325	58.84	61.52	0.3574	0.0356	0.0093	0.9923	91.45	91.87	92.58	92.28	92.58
8	-0.9562	-0.1107	0.1552	0.6146	58.24	60.19	0.3590	0.0326	0.0090	0.9933	91.95	91.54	92.28	91.91	92.21
9	-0.9704	-0.1219	0.1597	0.6004	57.42	58.82	0.3604	0.0353	0.0103	0.9931	91.05	90.58	91.39	91.07	91.40
10	-0.9762	-0.1276	0.1625	0.5946	56.84	57.96	0.3621	0.0386	0.0116	0.9927	90.11	89.90	90.77	90.49	90.84
11	-0.9819	-0.1336	0.1655	0.5889	56.28	57.08	0.3644	0.0442	0.0137	0.9919	88.58	89.08	90.01	89.82	90.19
12	-0.9905	-0.1525	0.1746	0.5803	54.85	55.02	0.3719	0.0570	0.0187	0.9901	85.17	86.43	87.57	88.32	88.73
13	-0.9779	-0.1561	0.1627	0.5929	53.26	53.53	0.3830	0.0671	0.0226	0.9888	82.73	83.42	84.80	84.74	85.27
14	-0.9507	-0.1712	0.2009	0.6201	51.24	52.07	0.4005	0.0807	0.0279	0.9869	79.52	77.53	79.39	78.84	79.56
15	-0.9130	-0.1741	0.2192	0.6578	49.27	50.06	0.4354	0.1279	0.0453	0.9795	69.87	70.83	73.21	71.19	72.17
16	-0.8767	-0.1849	0.2457	0.6941	47.99	48.65	0.4713	0.1874	0.0681	0.9694	59.00	63.52	66.47	63.64	64.84

NCORR INLET RAD/SEC	WCORR INLET KG/SEC	PO/PO INLET	EFF-AD INLET %	EFF-P INLET %	TO/TO INLET	TO2/TO1	PO2/PO1	EFF-AD STAGE %	EFF-P TOT-STG %
876.19	96.372	1.8984	85.31	86.57	1.2354	1.0898	0.9866	86.30	317.18

TABLE XIX (Cont'd)

AERODYNAMIC SUMMARY – STATOR 2
(English Units)

RUN NO   0,   SPEED CODE   0,   POINT NO   0

SL	EPSI-1 DEGREE	FPSI-2 DEGREE	V-1 FT/SEC	V-2 FT/SEC	VM-1 FT/SEC	VM-2 FT/SEC	VO-1 FT/SEC	VO-2 FT/SEC	B-1 DEGREE	B-2 DEGREE	M-1	M-2	PO/PO INLET	TO/TO INLET	PO/PO STAGE	TO2/TO1
1	8.242	9.838	790.0	568.8	475.3	568.3	631.3	0.0	52.7	0.0	0.6545	0.4613	1.8694	1.2708	1.3182	1.1063
2	7.090	8.306	778.3	579.8	513.9	579.8	584.5	0.0	48.5	0.0	0.6482	0.4742	1.8923	1.2549	1.3181	1.1016
3	6.145	7.022	766.6	588.8	544.8	588.8	539.3	0.0	44.6	0.0	0.6409	0.4842	1.9121	1.2430	1.3171	1.0961
4	5.347	5.942	756.0	590.3	562.2	590.3	505.5	0.0	41.9	0.0	0.6335	0.4871	1.9227	1.2351	1.3167	1.0924
5	4.664	5.030	750.2	590.3	574.4	590.3	482.5	0.0	40.0	0.0	0.6294	0.4880	1.9302	1.2311	1.3162	1.0904
6	3.513	3.548	734.0	582.1	581.3	582.1	448.2	0.0	37.6	0.0	0.6161	0.4819	1.9329	1.2260	1.3149	1.0882
7	2.605	2.440	715.3	569.7	576.9	569.7	422.9	0.0	36.2	0.0	0.5998	0.4716	1.9273	1.2242	1.3121	1.0872
8	1.882	1.624	695.6	556.8	568.3	556.8	401.1	0.0	35.2	0.0	0.5823	0.4606	1.9185	1.2233	1.3078	1.0865
9	1.321	1.041	676.5	544.6	558.2	544.6	382.2	0.0	34.4	0.0	0.5652	0.4500	1.9085	1.2237	1.3021	1.0858
10	1.085	0.814	665.9	537.2	551.6	537.2	373.0	0.0	34.1	0.0	0.5557	0.4436	1.9011	1.2241	1.2987	1.0855
11	0.885	0.633	655.9	529.8	545.4	529.8	364.3	0.0	33.7	0.0	0.5467	0.4371	1.8948	1.2247	1.2949	1.0851
12	0.586	0.396	635.6	513.3	531.6	513.3	348.5	0.0	33.2	0.0	0.5280	0.4224	1.8792	1.2283	1.2873	1.0845
13	0.464	0.313	625.1	502.6	518.4	502.6	349.3	0.0	34.0	0.0	0.5175	0.4122	1.8687	1.2343	1.2828	1.0868
14	0.321	0.216	619.5	495.7	504.2	495.7	360.0	0.0	35.5	0.0	0.5093	0.4038	1.8601	1.2500	1.2775	1.0917
15	0.155	0.100	621.2	485.3	491.5	485.3	379.8	0.0	37.7	0.0	0.5063	0.3917	1.8481	1.2705	1.2719	1.0996
16	-0.000	0.000	634.5	483.0	487.7	483.0	405.9	0.0	39.8	0.0	0.5116	0.3853	1.8416	1.2996	1.2651	1.1088

SL	INCS DEGREE	INCM DEGREE	DEV DEGREE	TURN DEGREE	RHOVM-1	RHOVM-2	D-FAC	OMEGA-B TOTAL	LOSS-P TOTAL	PO2/PO1 STATC-ST	%EFF-P STATC-ST	%EFF-A TOT-INLET	%EFF-P TOT-INLET	%EFF-A TOT-STG	%EFF-P TOT-STG
1	-37.29	-3.24	9.75	52.71	45.91	57.61	0.4399	0.2068	0.0420	0.9483	62.49	72.18	74.50	77.06	77.94
2	-41.54	-3.06	8.63	48.46	50.47	59.91	0.4100	0.1634	0.0343	0.9598	67.99	78.34	80.18	80.59	81.34
3	-45.44	-3.17	8.13	44.56	54.14	61.77	0.3823	0.1167	0.0253	0.9718	75.29	83.65	85.06	84.97	85.54
4	-48.14	-2.30	8.04	41.86	56.31	62.59	0.3672	0.0843	0.0189	0.9800	81.26	87.28	88.39	88.32	88.76
5	-50.02	-3.03	8.15	39.98	57.84	63.01	0.3605	0.0677	0.0156	0.9842	84.59	89.39	90.32	90.10	90.48
6	-52.39	-3.93	8.42	37.61	58.98	62.66	0.3561	0.0455	0.0112	0.9897	89.31	91.61	92.34	92.05	92.35
7	-53.76	-5.52	8.67	36.24	58.84	61.52	0.3574	0.0356	0.0093	0.9923	91.45	91.87	92.58	92.28	92.58
8	-54.78	-6.34	8.84	35.22	58.24	60.19	0.3590	0.0326	0.0090	0.9933	91.95	91.54	92.28	91.91	92.21
9	-55.60	-6.98	9.15	34.40	57.42	58.82	0.3604	0.0353	0.0103	0.9931	91.05	90.58	91.39	91.07	91.40
10	-55.93	-7.31	9.31	34.07	56.84	57.96	0.3621	0.0386	0.0116	0.9927	90.11	89.90	90.77	90.49	90.84
11	-56.26	-7.66	9.48	33.74	56.28	57.08	0.3644	0.0442	0.0137	0.9919	88.58	89.08	90.01	89.82	90.19
12	-56.75	-8.74	10.00	33.25	54.85	55.02	0.3719	0.0570	0.0187	0.9901	85.17	86.43	87.57	88.32	88.73
13	-56.03	-8.44	10.47	32.97	53.28	53.53	0.3839	0.0671	0.0226	0.9888	82.73	83.42	84.80	84.74	85.27
14	-54.47	-9.81	11.51	34.53	51.24	52.07	0.4005	0.0807	0.0279	0.9864	79.52	79.39	79.39	78.84	79.56
15	-52.31	-10.26	12.56	37.69	49.27	50.06	0.4354	0.1279	0.0453	0.9795	69.87	70.83	73.21	71.19	72.17
16	-50.23	-10.60	14.08	39.77	47.99	46.65	0.4713	0.1874	0.0681	0.9694	59.00	63.52	66.47	63.64	64.84

NCORR INLET RPM	WCORR INLET LBM/SEC	TO/TO INLET	PC/PC INLET	EFF-AD INLET %	EFF-P INLET %
8367.	212.50	1.2354	1.8984	85.31	86.57

TO2/TO1	PO2/PO1	EFF-AD STAGE %	EFF-P TOT-STG %
1.0898	0.9866	86.30	317.18

APPENDIX C

TABLE XX

AIRFOIL GEOMETRY ON DESIGN CONICAL SURFACES – ROTOR 1

(For Definitions see Figure 15 and 25)

	ROOT	TIP
	INCHES — METERS	INCHES — METERS
INLET DIAMETER =	13.16 — .334	32.90 — .836
EXIT DIAMETER =	14.52 — .369	32.90 — .836

MULTIPLE - CIRCULAR - ARC AIRFOILS, 28 BLADES

	HUB													TIP
PERCENT FLOW	.00	2.50	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	100.00
PERCENT SPAN (LE)	.00	4.31	8.37	15.88	29.08	40.60	50.97	60.47	69.30	77.59	85.42	92.88	96.48	100.00
PERCENT SPAN (AV)	.00	4.30	8.27	15.56	28.43	39.80	50.22	59.65	68.58	76.93	84.89	92.55	96.29	100.00
PERCENT SPAN (TE)	.00	4.29	8.17	15.24	27.78	38.99	49.28	58.83	67.80	76.28	84.37	92.21	96.10	100.00

SI Units (Meters & Radians)

	HUB	2.50	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	TIP
c	.0897	.0905	.0913	.0928	.0955	.0977	.1001	.1021	.1039	.1057	.1073	.1089	.1097	.1105
c_f	.0458	.0469	.0479	.0499	.0533	.0564	.0591	.0615	.0637	.0640	.0661	.0700	.0710	.0719
t/c	.0800	.0780	.0764	.0730	.0688	.0642	.0603	.0553	.0371	.0305	.0300	.0300	.0300	.0300
% c to max t	57.600	57.976	58.329	58.978	60.110	61.097	61.986	62.801	63.559	64.272	64.946	65.587	65.897	66.200
a/c	.5782	.5740	.5734	.5811	.5994	.6078	.5900	.5043	.5056	.6791	.7116	.7352	.7396	.7400
R_{LE} ($\times 10^2$)	.0330	.0323	.0315	.0300	.0272	.0249	.0229	.0209	.0190	.0179	.0178	.0178	.0178	.0178
R_{TE} ($\times 10^2$)	.0330	.0323	.0315	.0300	.0272	.0249	.0229	.0209	.0190	.0179	.0178	.0178	.0178	.0178
$\beta_1'^*$	.5689	.5727	.5903	.6256	.6834	.7413	.7989	.8443	.8808	.9053	.9245	.9424	.9589	.9743
$\beta_1'^* ss_1$	.6671	.6699	.6865	.7195	.7745	.8275	.8801	.9185	.9284	.9447	.9633	.9824	.9974	1.0129
ϕ_E	1.3247	1.1591	1.0635	.9075	.6711	.4824	.3430	.2604	.2014	.1610	.1255	.1257	.1548	.2114
ϕ	1.1496	1.1496	1.0507	.8902	.6527	.4665	.3307	.2518	.1960	.1584	.1255	.1267	.1577	.2116
ϕ_f	.3696	.3655	.3547	.3044	.2135	.1586	.1429	.1539	.1204	.0207	.0126	-.0428	-.0573	-.0698
ϕ_{ef}	.3502	.3472	.3370	.2877	.1998	.1479	.1349	.1484	.1169	.0190	.0124	-.0421	-.0569	-.0698
ϵ	.1948	.1884	.1776	.1546	.1140	.0834	.0600	.0412	.0254	.0118	.0000	-.0048	-.0041	-.0000
σ	2.2727	2.1640	2.0755	1.9350	1.7379	1.6021	1.5004	1.4203	1.3552	1.3009	1.2547	1.2142	1.1957	1.1784
s/c	.4400	.4621	.4818	.5168	.5754	.6242	.6665	.7041	.7379	.7687	.7970	.8236	.8363	.8486

English Units (Inches & Degrees)

	HUB	2.50	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	TIP
c	3.5300	3.5632	3.5955	3.6553	3.7615	3.8554	3.9405	4.0190	4.0922	4.1410	4.2263	4.2808	4.3194	4.3500
c_f	1.8020	1.8454	1.8671	1.9643	2.1001	2.2187	2.3254	2.4232	2.5140	2.5993	2.6779	2.7564	2.7937	2.8299
t/c	.0800	.0780	.0764	.0730	.0688	.0642	.0603	.0553	.0371	.0305	.0300	.0300	.0300	.0300
% c to max t	57.600	57.976	58.329	58.978	60.110	61.097	61.986	62.801	63.559	64.272	64.946	65.587	65.897	66.200
a/c	.5782	.5740	.5734	.5811	.5994	.6078	.5900	.5043	.5056	.6791	.7116	.7352	.7396	.7400
R_{LE}	.0130	.0127	.0124	.0118	.0107	.0098	.0090	.0082	.0075	.0071	.0070	.0070	.0070	.0070
R_{TE}	.0130	.0127	.0124	.0118	.0107	.0098	.0090	.0082	.0075	.0071	.0070	.0070	.0070	.0070
$\beta_1'^*$	32.598	32.812	33.823	35.847	39.155	42.476	45.776	48.376	50.422	51.870	52.971	54.067	54.939	55.824
$\beta_1'^* ss_1$	38.224	38.384	39.334	41.226	44.374	47.410	50.427	52.628	53.179	54.128	56.172	56.287	57.156	58.036
ϕ_E	75.898	66.412	60.935	51.996	38.453	27.640	19.654	14.921	11.539	9.225	7.189	7.200	8.983	12.124
ϕ	65.866	65.866	60.201	51.005	37.398	26.729	18.947	14.428	11.228	9.075	7.189	7.262	9.035	12.124
ϕ_f	21.175	20.944	20.325	17.439	12.231	9.086	8.185	8.815	6.899	1.186	.720	-2.450	-3.294	-4.000
ϕ_{ef}	20.064	19.893	19.311	16.485	11.450	8.475	7.729	8.500	6.700	1.089	.710	-2.410	-3.260	-4.000
ϵ	11.163	10.793	10.178	8.860	6.533	4.780	3.439	2.359	1.456	.677	.000	-.277	-.234	.000
σ	2.2727	2.1640	2.0755	1.9350	1.7379	1.6021	1.5004	1.4203	1.3552	1.3009	1.2547	1.2142	1.1957	1.1784
s/c	.4400	.4621	.4818	.5168	.5754	.6242	.6665	.7041	.7379	.7687	.7970	.8236	.8363	.8486

TABLE XXI

AIRFOIL GEOMETRY ON DESIGN CONICAL SURFACES – STATOR 1

	ROOT (INCHES)	ROOT (METERS)	TIP (INCHES)	TIP (METERS)
INLET DIAMETER =	15.48	.393	32.90	.836
EXIT DIAMETER =	16.46	.418	32.90	.836

MULTIPLE - CIRCULAR - ARC AIRFOILS, 62 VANES

	HUB												TIP
PERCENT FLOW	.00	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	100.00
PERCENT SPAN (LE)	.00	8.64	15.84	28.38	39.49	49.66	59.12	68.00	76.41	84.46	92.27	96.13	100.00
PERCENT SPAN (AV)	.00	6.08	14.81	27.19	38.36	48.66	58.29	67.36	75.97	84.21	92.19	96.11	100.00
PERCENT SPAN (TE)	.00	7.15	13.79	26.00	37.22	47.67	57.46	66.71	75.52	83.96	92.11	96.09	100.00

SI Units (Meters & Radians)

	HUB												TIP
c	.0513	.0517	.0521	.0528	.0533	.0538	.0543	.0548	.0552	.0556	.0560	.0562	.0564
c_f	.0179	.0145	.0170	.0175	.0182	.0188	.0193	.0200	.0207	.0218	.0240	.0254	.0282
t/c	.0500	.0526	.0547	.0585	.0618	.0649	.0677	.0704	.0729	.0753	.0777	.0788	.0800
% c to max t	51.100	50.411	50.232	50.072	50.002	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
a/c	.5478	.5343	.5273	.5150	.5067	.5022	.4985	.4965	.4927	.4849	.4779	.4811	.4909
R_{LE} ($\times10^2$)	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178
R_{TE} ($\times10^2$)	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178
β_1^*	.9579	.7901	.7227	.6667	.6416	.6262	.6184	.6144	.6157	.6290	.6817	.7167	.7645
β^*_{ss2}	1.0335	.8750	.8131	.7651	.7448	.7374	.7352	.7365	.7426	.7600	.8158	.8518	.9003
ϕ_ε	1.1150	.8556	.7579	.6831	.6509	.6300	.6157	.6082	.6075	.6217	.6897	.7691	.8657
ϕ_f	1.0800	.8375	.7463	.6773	.6494	.6276	.6140	.6069	.6066	.6210	.6891	.7688	.8657
ϕ_{ef}	.1213	.1312	.1438	.1789	.2018	.2115	.2187	.2268	.2393	.2680	.3283	.3738	.4380
ε	.1020	.1218	.1377	.1758	.1998	.2102	.2187	.2261	.2388	.2676	.3279	.3736	.4380
δ	.2772	.1835	.1362	.0849	.0587	.0432	.0330	.0260	.0210	.0172	.0120	.0072	.0000
σ	2.4981	2.3213	2.1891	1.9904	1.8430	1.7271	1.6327	1.5542	1.4872	1.4290	1.3778	1.3541	1.3317
s/c	.4003	.4308	.4568	.5024	.5426	.5790	.6125	.6434	.6724	.6998	.7258	.7385	.7509

English Units (Inches & Degrees)

	HUB												TIP
c	2.0200	2.0373	2.0517	2.0768	2.0990	2.1193	2.1382	2.1560	2.1728	2.1889	2.2045	2.2123	2.2200
c_f	.7040	.5709	.6688	.6888	.7155	.7384	.7605	.7881	.8150	.8596	.9462	1.0001	1.1100
t/c	.0500	.0526	.0547	.0585	.0618	.0649	.0677	.0704	.0729	.0753	.0777	.0788	.0800
% c to max t	51.100	50.411	50.232	50.072	50.002	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
a/c	.5478	.5343	.5273	.5150	.5067	.5022	.4985	.4965	.4927	.4849	.4779	.4811	.4909
R_{LE}	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070
R_{TE}	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070
β_1^*	54.862	45.268	41.410	38.199	36.742	35.879	35.429	35.205	35.278	36.039	39.054	41.064	43.801
β^*_{ss2}	59.212	50.133	46.588	43.839	42.791	42.252	42.121	42.179	42.546	43.544	46.743	48.802	51.586
ϕ_ε	63.882	49.023	43.423	39.140	37.294	36.095	35.276	34.845	34.808	35.622	39.515	44.065	49.601
ϕ_f	61.877	47.986	42.761	38.806	37.205	35.961	35.181	34.775	34.753	35.580	39.485	44.048	49.601
ϕ_{ef}	6.949	7.520	8.237	10.252	11.560	12.120	12.529	12.995	13.712	15.356	18.810	21.418	25.098
ε	5.843	6.977	7.892	10.073	11.449	12.045	12.529	12.954	13.680	15.330	18.790	21.405	25.098
δ	15.884	10.512	7.801	4.864	3.362	2.478	1.891	1.487	1.203	.988	.688	.410	.000
σ	2.4981	2.3213	2.1891	1.9904	1.8430	1.7271	1.6327	1.5542	1.4872	1.4290	1.3778	1.3541	1.3317
s/c	.4003	.4308	.4568	.5024	.5426	.5790	.6125	.6434	.6724	.6998	.7258	.7385	.7509

TABLE XXII

AIRFOIL GEOMETRY ON DESIGN CONICAL SURFACES – ROTOR 2

	ROOT		TIP	
	INCHES	METERS	INCHES	METERS
INLET DIAMETER =	16.89	.429	32.90	.836
EXIT DIAMETER =	18.26	.464	32.90	.836

MULTIPLE - CIRCULAR - ARC AIRFOILS, 35 BLADES

	HUB													TIP
PERCENT FLOW	.00	2.50	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	100.00
PERCENT SPAN (LE)	.00	4.19	8.01	14.99	27.32	38.38	48.58	58.14	67.20	75.84	84.15	92.19	95.00	100.00
PERCENT SPAN (AV)	.00	3.78	7.31	13.86	25.73	36.62	46.83	56.50	65.75	74.62	83.21	91.65	95.84	100.00
PERCENT SPAN (TE)	.00	3.38	6.60	12.73	24.14	34.86	45.08	54.87	64.29	73.41	82.28	91.12	95.56	100.00

SI Units (Meters & Radians)

c	.0859	.0860	.0861	.0863	.0866	.0868	.0871	.0873	.0875	.0877	.0879	.0881	.0882	.0883
c_f	.0302	.0310	.0317	.0330	.0353	.0373	.0392	.0410	.0427	.0443	.0458	.0473	.0480	.0488
t/c	.0800	.0776	.0755	.0717	.0649	.0588	.0532	.0480	.0347	.0300	.0300	.0300	.0300	.0300
% c to max. t	51.200	51.575	51.915	52.531	53.615	54.585	55.480	56.319	57.115	57.875	58.606	59.314	59.640	60.000
a/c	.5512	.5497	.5470	.5423	.5426	.5440	.5533	.549	.6004	.6359	.6854	.6854	.6937	.6920
$RLE (\times 10^2)$	.0317	.0310	.0305	.0293	.0272	.0254	.0239	.0221	.0205	.0193	.0183	.0178	.0178	.0178
$RTE (\times 10^2)$	.0317	.0310	.0305	.0292	.0272	.0254	.0239	.0221	.0205	.0193	.0180	.0178	.0178	.0178
β'_1	.8079	.7888	.7815	.7868	.8201	.8616	.8931	.9154	.9407	.9635	.9826	.9994	1.0083	1.0204
$\beta'_{1}* {}_{ss_1}$	.9367	.9122	.8999	.8965	.9158	.9458	.9675	.9811	.9862	.9407	.9826	1.0383	1.0472	1.0593
ϕ	1.0348	1.0076	.7979	.6466	.4844	.3709	.2819	.2219	.1722	.1404	.1021	1.0214	1.1077	1.1496
ϕ_e	1.0034	.8764	.7691	.6220	.4667	.3589	.2744	.2190	.1712	.1417	.1164	.1038	.1091	.1496
ϕ_f	.1013	.1152	.1284	.1388	.1245	.1049	.0803	.0737	.0226	.0108	-.0274	.0525	-.0635	-.0678
ε_f	.0801	.0971	.1126	.1261	.1159	.1011	.0767	.0718	.0221	-.0102	.0262	-.0512	-.0627	-.0698
σ	2.1441	2.0768	2.0186	1.9190	1.7630	1.6415	1.5423	1.4588	1.3877	1.3257	1.2711	1.2219	1.1990	1.1770
s/c	.4664	.4815	.4954	.5211	.5672	.6092	.6484	.6855	.7206	.7543	.7867	.8184	.8340	.8496

English Units (Inches & Degrees)

c	3.3820	3.3860	3.3897	3.3962	3.4078	3.4182	3.4277	3.4366	3.4452	3.4534	3.4611	3.4687	3.4723	3.4760
c_f	1.1900	1.2206	1.2485	1.2994	1.3895	1.4702	1.5446	1.6144	1.6805	1.7436	1.8043	1.8630	1.8917	1.9200
t/c	.0800	.0776	.0755	.0717	.0649	.0588	.0532	.0480	.0347	.0300	.0300	.0300	.0300	.0300
% c to max. t	51.200	51.575	51.915	52.531	53.615	54.585	55.480	56.319	57.115	57.875	58.606	59.314	59.640	60.000
a/c	.5512	.5497	.5470	.5423	.5426	.5440	.5533	.549	.6004	.6359	.6854	.6854	.6937	.6920
RLE	.0125	.0122	.0120	.0115	.0107	.0100	.0094	.0087	.0081	.0076	.0071	.0070	.0070	.0070
RTE	.0125	.0122	.0120	.0115	.0107	.0100	.0094	.0087	.0081	.0076	.0072	.0070	.0070	.0070
β'_1	46.289	45.195	44.777	45.078	46.988	49.366	51.17	52.447	53.896	55.205	56.300	57.262	57.770	58.442
$\beta'_{1}* {}_{ss_1}$	53.670	52.264	51.561	51.365	52.470	54.188	55.433	56.211	56.505	57.188	56.522	59.807	60.001	60.168
ϕ	57.289	52.003	50.212	44.068	45.715	44.068	37.049	27.756	21.253	16.150	12.716	9.867	8.057	4.252
ϕ_e	57.297	50.212	44.068	35.439	26.742	20.561	15.720	12.497	9.807	8.121	6.670	5.809	5.947	4.252
ϕ_f	5.803	5.561	7.358	7.225	7.136	5.793	4.602	4.220	4.111	1.265	.617	.121	-3.007	-3.639
ε_f	4.589	4.450	6.450	6.439	6.639	5.566	4.393	4.220	1.145	-.584	1.500	-.617	-2.932	-4.000
σ	2.1441	2.0768	2.0186	1.9190	1.7630	1.6415	1.5423	1.4588	1.3877	1.3257	1.2711	1.2219	1.1990	1.1770
s/c	.4664	.4815	.4954	.5211	.5672	.6092	.6484	.6855	.7206	.7543	.7867	.8184	.8340	.8496

TABLE XXIII

AIRFOIL GEOMETRY ON DESIGN CONICAL SURFACES – STATOR 2

	ROOT		TIP	
	INCHES	METERS	INCHES	METERS
INLET DIAMETER =	18.55	.471	32.90	.836
EXIT DIAMETER =	19.30	.490	32.90	.836

65 / CIRCULAR - ARC AIRFOILS, 76 VANES

	HUB													TIP
PERCENT FLOW	.00	2.50	5.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.00	100.00
PERCENT SPAN (LE)	.00	3.86	7.41	13.95	25.68	36.42	46.50	56.08	65.24	74.13	82.77	91.37	95.68	100.00
PERCENT SPAN (AV)	.00	3.60	6.96	13.26	24.76	35.43	45.54	55.20	64.52	73.56	82.40	91.19	95.59	100.00
PERCENT SPAN (TE)	.00	3.34	6.52	12.57	23.84	34.44	44.57	54.33	63.78	72.99	82.03	91.01	95.50	100.00

SI Units (Meters & Radians)

	HUB													TIP
c	.0489	.0489	.0488	.0486	.0484	.0482	.0481	.0480	.0479	.0478	.0477	.0476	.0476	.0475
t/c	.0700	.0704	.0707	.0713	.0725	.0735	.0746	.0755	.0765	.0774	.0782	.0791	.0791	.0796
% c to max t	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
a/c	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000
$RLE (\times 10^3)$	.0178	.0178	.0178	.0178	.0178	.0178	.0188	.0185	.0191	.0196	.0198	.0200	.0203	.0204
$RTE (\times 10^2)$	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178	.0178
β'^*_z	.9766	.9081	.8547	.7660	.7242	.7291	.7256	.7223	.7221	.7237	.7439	.8103	.8475	.8791
ϕ	1.1468	1.0601	.9971	.9062	.8704	.8802	.8805	.7069	.8663	.8934	.9246	1.0174	1.0707	1.1248
ϵ	.2057	.1788	.1587	.1268	.0857	.0582	.0390	.0256	.0163	.0121	.0082	.0045	.0020	.0000
σ	2.4631	2.3946	2.3343	2.2292	2.0597	1.9238	1.8109	1.7144	1.6308	1.5574	1.4914	1.4312	1.4029	1.3755
s/c	.4060	.4176	.4284	.4486	.4855	.5190	.5522	.5833	.6132	.6421	.6705	.6987	.7128	.7270

English Units (Inches & Degrees)

	HUB													TIP
c	1.9268	1.9234	1.9203	1.9150	1.9064	1.8992	1.8935	1.8882	1.8839	1.8805	1.8769	1.8738	1.8724	1.8707
t/c	.0700	.0704	.0707	.0713	.0725	.0735	.0746	.0755	.0765	.0774	.0782	.0791	.0791	.0796
% c to max t	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000
a/c	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000
RLE	.0070	.0070	.0070	.0070	.0070	.0070	.0071	.0073	.0075	.0077	.0078	.0079	.0080	.0081
RTE	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070	.0070
β'^*_z	55.956	52.080	48.969	43.888	41.496	41.772	41.573	41.382	41.373	41.465	42.620	46.424	48.558	50.366
ϕ	65.708	60.738	57.129	51.921	49.868	50.429	50.450	50.502	50.781	51.189	52.973	58.407	61.347	64.446
ϵ	11.788	10.243	9.090	7.266	4.909	3.337	2.233	1.466	.934	.491	.470	.258	.115	.000
σ	2.4631	2.3946	2.3343	2.2292	2.0597	1.9238	1.8109	1.7144	1.6308	1.5574	1.4914	1.4312	1.4029	1.3755
s/c	.4060	.4176	.4284	.4486	.4855	.5190	.5522	.5833	.6132	.6421	.6705	.6987	.7128	.7270

APPENDIX D

TABLE XXIV

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

(For Definitions see Figure 26)

English Units (Inches)			SI Units (Meters)		
Z_C	YP	YS	Z_C	YP	YS
.0000	-.0131	.0156	.0000	-.0003	.0004
.0107	-.0073	.0245	.0003	-.0002	.0006
.1095	.0459	.1065	.0028	.0012	.0027
.2190	.1027	.1922	.0056	.0026	.0049
.3285	.1567	.2721	.0083	.0040	.0069
.4380	.2079	.3467	.0111	.0053	.0088
.5475	.2564	.4164	.0139	.0065	.0106
.6571	.3023	.4814	.0167	.0077	.0122
.7666	.3455	.5419	.0195	.0088	.0138
.8761	.3863	.5982	.0223	.0098	.0152
.9856	.4245	.6505	.0250	.0108	.0165
1.0951	.4603	.6988	.0278	.0117	.0178
1.2046	.4937	.7435	.0306	.0125	.0189
1.3141	.5246	.7845	.0334	.0133	.0199
1.4236	.5533	.8225	.0362	.0141	.0209
1.5331	.5800	.8567	.0389	.0147	.0218
1.6426	.6038	.8856	.0417	.0153	.0225
1.7522	.6221	.9066	.0445	.0158	.0230
1.8617	.6341	.9196	.0473	.0161	.0234
1.9712	.6395	.9247	.0501	.0162	.0235
2.0807	.6381	.9218	.0528	.0162	.0234
2.1902	.6299	.9107	.0556	.0160	.0231
2.2997	.6146	.8913	.0584	.0156	.0226
2.4092	.5920	.8630	.0612	.0150	.0219
2.5187	.5618	.8253	.0640	.0143	.0210
2.6282	.5236	.7777	.0668	.0133	.0198
2.7377	.4768	.7189	.0695	.0121	.0183
2.8473	.4210	.6480	.0723	.0107	.0165
2.9568	.3557	.5634	.0751	.0090	.0143
3.0663	.2798	.4623	.0779	.0071	.0117
3.1758	.1933	.3453	.0807	.0049	.0088
3.2853	.0940	.2017	.0834	.0024	.0051
3.3861	-.0096	.0444	.0860	-.0002	.0011
3.3948	-.0185	.0308	.0862	-.0005	.0008

English Units (Inches)			SI Units (Meters)		
RADIUS (INCHES) =	6.574		RADIUS (METERS) =	.1670	
CHORD (INCHES) =	3.395		CHORD (METERS) =	.0862	
ZCSL (INCHES) =	1.8005		ZCSL (METERS) =	.0457	
YCSL (INCHES) =	.5938		YCSL (METERS) =	.0151	
RLE (INCHES) =	.0130		RLE (METERS) =	.000330	
RTE (INCHES) =	.0164		RTE (METERS) =	.000417	
X-AREA (SQ. IN.) =	.7238		X-AREA(SQ.METERS) =	.000467	
GAMMA-CHORD(DEG.) =	-1.79		GAMMA-CHORD(RAD.) =	-.0313	

English Units (Inches)			SI Units (Meters)		
Z_C	YP	YS	Z_C	YP	YS
.0000	-.0127	.0150	.0000	-.0003	.0004
.0108	-.0073	.0233	.0003	-.0002	.0006
.1100	.0421	.0999	.0028	.0011	.0025
.2201	.0947	.1800	.0056	.0024	.0046
.3301	.1444	.2547	.0084	.0037	.0065
.4401	.1913	.3242	.0112	.0049	.0082
.5501	.2356	.3891	.0140	.0060	.0099
.6602	.2773	.4495	.0168	.0070	.0114
.7702	.3164	.5057	.0196	.0080	.0128
.8802	.3530	.5577	.0224	.0090	.0142
.9903	.3871	.6058	.0252	.0098	.0154
1.1003	.4189	.6501	.0279	.0106	.0165
1.2103	.4483	.6909	.0307	.0114	.0175
1.3204	.4754	.7281	.0335	.0121	.0185
1.4304	.5003	.7622	.0363	.0127	.0194
1.5404	.5231	.7928	.0391	.0133	.0201
1.6504	.5438	.8198	.0419	.0138	.0208
1.7605	.5602	.8401	.0447	.0142	.0213
1.8705	.5712	.8532	.0475	.0145	.0217
1.9805	.5765	.8589	.0503	.0146	.0218
2.0906	.5758	.8571	.0531	.0146	.0218
2.2006	.5691	.8478	.0559	.0145	.0215
2.3106	.5561	.8305	.0587	.0141	.0211
2.4206	.5364	.8049	.0615	.0136	.0204
2.5307	.5099	.7705	.0643	.0130	.0196
2.6407	.4761	.7267	.0671	.0121	.0185
2.7507	.4345	.6725	.0699	.0110	.0171
2.8608	.3846	.6066	.0727	.0098	.0154
2.9708	.3258	.5278	.0755	.0083	.0134
3.0808	.2571	.4331	.0783	.0065	.0110
3.1909	.1782	.3222	.0810	.0045	.0082
3.3009	.0873	.1857	.0838	.0022	.0047
3.4030	-.0075	.0353	.0864	-.0002	.0009
3.4109	-.0149	.0235	.0866	-.0004	.0006

English Units (Inches)			SI Units (Meters)		
RADIUS (INCHES) =	6.913		RADIUS (METERS) =	.1756	
CHORD (INCHES) =	3.411		CHORD (METERS) =	.0866	
ZCSL (INCHES) =	1.8133		ZCSL (METERS) =	.0461	
YCSL (INCHES) =	.5483		YCSL (METERS) =	.0139	
RLE (INCHES) =	.0129		RLE (METERS) =	.000328	
RTE (INCHES) =	.0136		RTE (METERS) =	.000345	
X-AREA (SQ. IN.) =	.7090		X-AREA(SQ.METERS) =	.000457	
GAMMA-CHORD(DEG.) =	.62		GAMMA-CHORD(RAD.) =	.0108	

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0123	.0143	.0000	-.0003	.0004
.0108	-.0074	.0221	.0003	-.0002	.0006
.1110	-.0389	.0942	.0028	.0010	.0024
.2220	.0878	.1694	.0056	.0022	.0043
.3330	.1340	.2396	.0085	.0034	.0061
.4440	.1774	.3048	.0113	.0045	.0077
.5550	.2182	.3655	.0141	.0055	.0093
.6661	.2563	.4218	.0169	.0065	.0107
.7771	.2919	.4739	.0197	.0074	.0120
.8881	.3249	.5221	.0226	.0083	.0133
.9991	.3555	.5663	.0254	.0090	.0144
1.1101	.3835	.6068	.0282	.0097	.0154
1.2211	.4091	.6437	.0310	.0104	.0164
1.3321	.4323	.6770	.0338	.0110	.0172
1.4431	.4533	.7071	.0367	.0115	.0180
1.5541	.4719	.7340	.0395	.0120	.0186
1.6651	.4888	.7578	.0423	.0124	.0192
1.7762	.5022	.7765	.0451	.0128	.0197
1.8872	.5113	.7888	.0479	.0130	.0200
1.9982	.5155	.7942	.0508	.0131	.0202
2.1092	.5145	.7927	.0536	.0131	.0201
2.2202	.5082	.7840	.0564	.0129	.0199
2.3312	.4964	.7680	.0592	.0126	.0195
2.4422	.4787	.7442	.0620	.0122	.0189
2.5532	.4550	.7122	.0649	.0116	.0181
2.6642	.4248	.6713	.0677	.0108	.0171
2.7753	.3879	.6208	.0705	.0099	.0158
2.8863	.3436	.5598	.0733	.0087	.0142
2.9973	.2913	.4866	.0761	.0074	.0124
3.1083	.2303	.3991	.0790	.0059	.0101
3.2193	.1599	.2956	.0818	.0041	.0075
3.3303	.0784	.1692	.0846	.0020	.0043
3.4336	-.0063	.0294	.0872	-.0002	.0007
3.4413	-.0127	.0190	.0874	-.0003	.0005

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RADIUS (INCHES)   = 7.253        RADIUS (METERS)   = .1842
CHORD (INCHES)    = 3.441        CHORD (METERS)    = .0874
ZCSL (INCHES)     = 1.8334       ZCSL (METERS)     = .0466
YCSL (INCHES)     = .5031        YCSL (METERS)     = .0128
RLE (INCHES)      = .0126        RLE (METERS)      = .000320
RTE (INCHES)      = .0120        RTE (METERS)      = .000305
X-AREA (SQ. IN.)  = .6957        X-AREA(SQ.METERS) = .000449
GAMMA-CHORD(DEG.) = 3.57         GAMMA-CHORD(RAD.) = .0623
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English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0122	.0141	.0000	-.0003	.0004
.0108	-.0073	.0216	.0003	-.0002	.0005
.1115	-.0380	.0923	.0028	.0010	.0023
.2230	.0853	.1656	.0057	.0022	.0042
.3345	.1299	.2338	.0085	.0033	.0059
.4460	.1719	.2973	.0113	.0044	.0076
.5575	.2112	.3564	.0142	.0054	.0091
.6690	.2480	.4113	.0170	.0063	.0104
.7805	.2822	.4620	.0198	.0072	.0117
.8921	.3139	.5088	.0227	.0080	.0129
1.0036	.3432	.5517	.0255	.0087	.0140
1.1151	.3700	.5909	.0283	.0094	.0150
1.2266	.3944	.6266	.0312	.0100	.0159
1.3381	.4163	.6587	.0340	.0106	.0167
1.4496	.4359	.6874	.0368	.0111	.0175
1.5611	.4531	.7128	.0397	.0115	.0181
1.6726	.4683	.7351	.0425	.0119	.0187
1.7841	.4804	.7528	.0453	.0122	.0191
1.8956	.4884	.7642	.0481	.0124	.0194
2.0071	.4917	.7690	.0510	.0125	.0195
2.1186	.4902	.7670	.0538	.0125	.0195
2.2301	.4838	.7583	.0566	.0123	.0193
2.3416	.4722	.7425	.0595	.0120	.0189
2.4531	.4551	.7191	.0623	.0116	.0183
2.5647	.4323	.6878	.0651	.0110	.0175
2.6762	.4034	.6480	.0680	.0102	.0165
2.7877	.3680	.5988	.0708	.0093	.0152
2.8992	.3257	.5394	.0736	.0083	.0137
3.0107	.2759	.4683	.0765	.0070	.0119
3.1222	.2179	.3835	.0793	.0055	.0097
3.2337	.1509	.2831	.0821	.0038	.0072
3.3452	.0738	.1618	.0850	.0019	.0041
3.4488	-.0062	.0282	.0876	-.0002	.0007
3.4567	-.0123	.0180	.0878	-.0003	.0005

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RADIUS (INCHES)   = 7.392        RADIUS (METERS)   = .1878
CHORD (INCHES)    = 3.457        CHORD (METERS)    = .0878
ZCSL (INCHES)     = 1.8421       ZCSL (METERS)     = .0468
YCSL (INCHES)     = .4851        YCSL (METERS)     = .0123
RLE (INCHES)      = .0125        RLE (METERS)      = .000317
RTE (INCHES)      = .0119        RTE (METERS)      = .000302
X-AREA (SQ. IN.)  = .6917        X-AREA(SQ.METERS) = .000446
GAMMA-CHORD(DEG.) = 4.93         GAMMA-CHORD(RAD.) = .0861
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TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0119	.0136	.0000	-.0003	.0003	.0000	-.0116	.0132	.0000	-.0003	.0003
.0108	-.0074	.0208	.0003	-.0002	.0005	.0107	-.0074	.0200	.0003	-.0002	.0005
.1123	.0355	.0885	.0029	.0009	.0022	.1131	.0333	.0850	.0029	.0008	.0022
.2247	.0809	.1592	.0057	.0021	.0040	.2262	.0762	.1528	.0057	.0019	.0039
.3370	.1236	.2252	.0086	.0031	.0057	.3393	.1168	.2163	.0086	.0030	.0055
.4493	.1639	.2868	.0114	.0042	.0073	.4524	.1550	.2755	.0115	.0039	.0070
.5617	.2017	.3440	.0143	.0051	.0087	.5655	.1909	.3307	.0144	.0048	.0084
.6740	.2370	.3972	.0171	.0060	.0101	.6786	.2244	.3819	.0172	.0057	.0097
.7863	.2698	.4464	.0200	.0069	.0113	.7917	.2556	.4294	.0201	.0065	.0109
.8987	.3001	.4917	.0228	.0076	.0125	.9048	.2845	.4732	.0230	.0072	.0120
1.0110	.3280	.5332	.0257	.0083	.0135	1.0179	.3111	.5133	.0259	.0079	.0130
1.1233	.3534	.5710	.0285	.0090	.0145	1.1311	.3353	.5500	.0287	.0085	.0140
1.2357	.3760	.6050	.0314	.0096	.0154	1.2442	.3572	.5832	.0316	.0091	.0148
1.3480	.3963	.6355	.0342	.0101	.0161	1.3573	.3768	.6129	.0345	.0096	.0156
1.4603	.4141	.6625	.0371	.0105	.0168	1.4704	.3940	.6393	.0373	.0100	.0162
1.5727	.4296	.6863	.0399	.0109	.0174	1.5835	.4088	.6624	.0402	.0104	.0168
1.6850	.4431	.7069	.0428	.0113	.0180	1.6966	.4215	.6823	.0431	.0107	.0173
1.7973	.4536	.7235	.0457	.0115	.0184	1.8097	.4313	.6986	.0460	.0110	.0177
1.9097	.4604	.7341	.0485	.0117	.0186	1.9228	.4377	.7091	.0488	.0111	.0180
2.0220	.4628	.7383	.0514	.0118	.0188	2.0359	.4397	.7133	.0517	.0112	.0181
2.1343	.4604	.7358	.0542	.0117	.0187	2.1490	.4372	.7108	.0546	.0111	.0181
2.2467	.4533	.7266	.0571	.0115	.0185	2.2621	.4299	.7016	.0575	.0109	.0178
2.3590	.4413	.7104	.0599	.0112	.0180	2.3752	.4180	.6856	.0603	.0106	.0174
2.4713	.4242	.6869	.0628	.0108	.0174	2.4883	.4014	.6624	.0632	.0102	.0168
2.5837	.4018	.6557	.0656	.0102	.0167	2.6014	.3796	.6319	.0661	.0096	.0160
2.6960	.3738	.6164	.0685	.0095	.0157	2.7145	.3526	.5933	.0689	.0090	.0151
2.8084	.3401	.5683	.0713	.0086	.0144	2.8276	.3201	.5462	.0718	.0081	.0139
2.9207	.3001	.5106	.0742	.0076	.0130	2.9407	.2817	.4898	.0747	.0072	.0124
3.0330	.2536	.4421	.0770	.0064	.0112	3.0539	.2372	.4229	.0776	.0060	.0107
3.1454	.2000	.3613	.0799	.0051	.0092	3.1670	.1860	.3443	.0804	.0047	.0087
3.2577	.1381	.2658	.0827	.0035	.0068	3.2801	.1276	.2522	.0833	.0032	.0064
3.3700	.0672	.1517	.0856	.0017	.0039	3.3932	.0615	.1434	.0862	.0016	.0036
3.4739	-.0062	.0275	.0882	-.0002	.0007	3.4974	-.0062	.0266	.0888	-.0002	.0007
3.4824	-.0122	.0174	.0885	-.0003	.0004	3.5063	-.0119	.0166	.0891	-.0003	.0004

English Units		SI Units		English Units		SI Units	
RADIUS (INCHES) =	7.592	RADIUS (METERS) =	.1928	RADIUS (INCHES) =	7.792	RADIUS (METERS) =	.1979
CHORD (INCHES) =	3.482	CHORD (METERS) =	.0885	CHORD (INCHES) =	3.506	CHORD (METERS) =	.0891
ZCSL (INCHES) =	1.8569	ZCSL (METERS) =	.0472	ZCSL (INCHES) =	1.8717	ZCSL (METERS) =	.0475
YCSL (INCHES) =	.4616	YCSL (METERS) =	.0117	YCSL (INCHES) =	.4414	YCSL (METERS) =	.0112
RLE (INCHES) =	.0123	RLE (METERS) =	.000312	RLE (INCHES) =	.0121	RLE (METERS) =	.000307
RTE (INCHES) =	.0121	RTE (METERS) =	.000307	RTE (INCHES) =	.0122	RTE (METERS) =	.000310
X-AREA (SQ. IN.) =	.6877	X-AREA(SQ.METERS)=	.000444	X-AREA (SQ. IN.) =	.684	X-AREA(SQ.METERS)=	.000441
GAMMA-CHORD(DEG.)=	6.96	GAMMA-CHORD(RAD.)=	.1215	GAMMA-CHORD(DEG.)=	8.82	GAMMA-CHORD(RAD.)=	.1539

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0114	.0128	.0000	-.0003	.0003
.0107	-.0074	.0193	.0003	-.0002	.0005
.1139	.0311	.0817	.0029	.0008	.0021
.2277	.0717	.1467	.0058	.0018	.0037
.3416	.1101	.2076	.0087	.0028	.0053
.4555	.1463	.2645	.0116	.0037	.0067
.5693	.1803	.3177	.0145	.0046	.0081
.6832	.2121	.3671	.0174	.0054	.0093
.7971	.2418	.4129	.0202	.0061	.0105
.9109	.2692	.4552	.0231	.0068	.0116
1.0248	.2945	.4940	.0260	.0075	.0125
1.1387	.3176	.5295	.0289	.0081	.0134
1.2525	.3385	.5616	.0318	.0086	.0143
1.3664	.3571	.5905	.0347	.0091	.0150
1.4803	.3735	.6160	.0376	.0095	.0156
1.5941	.3877	.6385	.0405	.0098	.0162
1.7080	.3998	.6578	.0434	.0102	.0167
1.8219	.4094	.6739	.0463	.0104	.0171
1.9358	.4158	.6846	.0492	.0106	.0174
2.0496	.4181	.6892	.0521	.0106	.0175
2.1635	.4160	.6872	.0550	.0106	.0175
2.2774	.4094	.6788	.0578	.0104	.0172
2.3912	.3982	.6635	.0607	.0101	.0169
2.5051	.3823	.6412	.0636	.0097	.0163
2.6190	.3615	.6115	.0665	.0092	.0155
2.7328	.3356	.5740	.0694	.0085	.0146
2.8467	.3043	.5281	.0723	.0077	.0134
2.9606	.2675	.4730	.0752	.0068	.0120
3.0744	.2248	.4079	.0781	.0057	.0104
3.1883	.1759	.3314	.0810	.0045	.0084
3.3022	.1202	.2422	.0839	.0031	.0062
3.4161	.0576	.1374	.0868	.0015	.0035
3.5208	-.0062	.0257	.0894	-.0002	.0007
3.5299	-.0117	.0160	.0897	-.0003	.0004

	English Units (Inches)		SI Units (Meters)	
RADIUS	(INCHES) = 7.991		(METERS) = .2030	
CHORD	(INCHES) = 3.530		(METERS) = .0897	
ZCSL	(INCHES) = 1.8857		(METERS) = .0479	
YCSL	(INCHES) = .1225		(METERS) = .0107	
RLE	(INCHES) = .0119		(METERS) = .000302	
RTE	(INCHES) = .0121		(METERS) = .000307	
X-AREA	(SQ. IN.) = .6802		(SQ.METERS) = .000439	
GAMMA-CHORD	(DEG.) = 10.65		(RAD.) = .1858	

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0110	.0123	.0000	-.0003	.0003
.0106	-.0075	.0182	.0003	-.0002	.0005
.1151	.0274	.0764	.0029	.0007	.0019
.2301	.0643	.1371	.0058	.0016	.0035
.3452	.0992	.1941	.0088	.0025	.0049
.4603	.1321	.2474	.0117	.0034	.0063
.5753	.1632	.2973	.0146	.0041	.0076
.6904	.1923	.3438	.0175	.0049	.0087
.8054	.2194	.3870	.0205	.0056	.0098
.9205	.2446	.4269	.0234	.0062	.0108
1.0356	.2678	.4635	.0263	.0068	.0118
1.1506	.2890	.4970	.0292	.0073	.0126
1.2657	.3082	.5274	.0321	.0078	.0134
1.3808	.3253	.5547	.0351	.0083	.0141
1.4958	.3404	.5790	.0380	.0086	.0147
1.6109	.3534	.6002	.0409	.0090	.0152
1.7260	.3645	.6186	.0438	.0093	.0157
1.8410	.3734	.6341	.0468	.0095	.0161
1.9561	.3796	.6447	.0497	.0096	.0164
2.0712	.3821	.6497	.0526	.0097	.0165
2.1862	.3805	.6484	.0555	.0097	.0165
2.3013	.3747	.6408	.0585	.0095	.0163
2.4164	.3647	.6266	.0614	.0093	.0159
2.5314	.3502	.6056	.0643	.0089	.0154
2.6465	.3312	.5776	.0672	.0084	.0147
2.7615	.3076	.5421	.0701	.0078	.0138
2.8766	.2790	.4986	.0731	.0071	.0127
2.9917	.2452	.4464	.0760	.0062	.0113
3.1067	.2061	.3847	.0789	.0052	.0098
3.2218	.1612	.3124	.0818	.0041	.0079
3.3369	.1102	.2281	.0848	.0028	.0058
3.4519	.0526	.1293	.0877	.0013	.0033
3.5578	-.0061	.0241	.0904	-.0002	.0006
3.5670	-.0112	.0149	.0906	-.0003	.0004

	English Units (Inches)		SI Units (Meters)	
RADIUS	(INCHES) = 8.290		(METERS) = .2106	
CHORD	(INCHES) = 3.567		(METERS) = .0906	
ZCSL	(INCHES) = 1.9065		(METERS) = .0484	
YCSL	(INCHES) = .3919		(METERS) = .0100	
RLE	(INCHES) = .0117		(METERS) = .000297	
RTE	(INCHES) = .0118		(METERS) = .000300	
X-AREA	(SQ. IN.) = .6749		(SQ.METERS) = .000435	
GAMMA-CHORD	(DEG.) = 13.46		(RAD.) = .2348	

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TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — ROTOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0108	.0120	.0000	-.0003	.0003	.0000	-.0107	.0117	.0000	-.0003	.0003
.0106	-.0076	.0176	.0003	-.0002	.0004	.0106	-.0076	.0170	.0003	-.0002	.0004
.1159	.0249	.0729	.0029	.0006	.0019	.1167	.0226	.0697	.0030	.0006	.0018
.2318	.0593	.1309	.0059	.0015	.0033	.2334	.0546	.1250	.0059	.0014	.0032
.3476	.0918	.1853	.0088	.0023	.0047	.3501	.0849	.1770	.0089	.0022	.0045
.4635	.1226	.2364	.0118	.0031	.0060	.4668	.1136	.2258	.0119	.0029	.0057
.5794	.1516	.2841	.0147	.0039	.0072	.5835	.1406	.2715	.0148	.0036	.0069
.6953	.1788	.3287	.0177	.0045	.0083	.7002	.1659	.3141	.0178	.0042	.0080
.8112	.2042	.3701	.0206	.0052	.0094	.8169	.1896	.3538	.0207	.0048	.0090
.9271	.2277	.4084	.0235	.0058	.0104	.9336	.2116	.3905	.0237	.0054	.0099
1.0429	.2495	.4436	.0265	.0063	.0113	1.0503	.2319	.4244	.0267	.0059	.0108
1.1588	.2694	.4758	.0294	.0068	.0121	1.1670	.2504	.4553	.0296	.0064	.0116
1.2747	.2874	.5051	.0324	.0073	.0128	1.2837	.2673	.4834	.0326	.0068	.0123
1.3906	.3035	.5314	.0353	.0077	.0135	1.4004	.2824	.5087	.0356	.0072	.0129
1.5065	.3178	.5547	.0383	.0081	.0141	1.5171	.2957	.5312	.0385	.0075	.0135
1.6224	.3301	.5752	.0412	.0084	.0146	1.6338	.3073	.5510	.0415	.0078	.0140
1.7382	.3406	.5929	.0442	.0087	.0151	1.7505	.3171	.5680	.0445	.0081	.0144
1.8541	.3490	.6079	.0471	.0089	.0154	1.8672	.3250	.5827	.0474	.0083	.0148
1.9700	.3551	.6185	.0500	.0090	.0157	1.9839	.3309	.5931	.0504	.0084	.0151
2.0859	.3577	.6237	.0530	.0091	.0158	2.1006	.3336	.5986	.0534	.0085	.0152
2.2018	.3564	.6227	.0559	.0091	.0158	2.2173	.3325	.5979	.0563	.0084	.0152
2.3177	.3512	.6154	.0589	.0089	.0156	2.3339	.3277	.5911	.0593	.0083	.0150
2.4335	.3419	.6018	.0618	.0087	.0153	2.4506	.3190	.5780	.0622	.0081	.0147
2.5494	.3284	.5816	.0648	.0083	.0148	2.5673	.3063	.5585	.0652	.0078	.0142
2.6653	.3105	.5546	.0677	.0079	.0141	2.6840	.2895	.5322	.0682	.0074	.0135
2.7812	.2883	.5203	.0706	.0073	.0132	2.8007	.2685	.4989	.0711	.0068	.0127
2.8971	.2614	.4784	.0736	.0066	.0122	2.9174	.2432	.4582	.0741	.0062	.0116
3.0129	.2297	.4280	.0765	.0058	.0109	3.0341	.2134	.4094	.0771	.0054	.0104
3.1288	.1929	.3686	.0795	.0049	.0094	3.1508	.1788	.3520	.0800	.0045	.0089
3.2447	.1507	.2991	.0824	.0038	.0076	3.2675	.1394	.2850	.0830	.0035	.0072
3.3606	.1029	.2181	.0854	.0026	.0055	3.3842	.0947	.2074	.0860	.0024	.0053
3.4765	.0488	.1237	.0883	.0012	.0031	3.5009	.0446	.1175	.0889	.0011	.0030
3.5830	-.0061	.0233	.0910	-.0002	.0006	3.6080	-.0062	.0226	.0916	-.0002	.0006
3.5924	-.0110	.0145	.0912	-.0003	.0004	3.6176	-.0108	.0140	.0919	-.0003	.0004

RADIUS (INCHES) = 8.490			RADIUS (METERS) = .2156			RADIUS (INCHES) = 8.690			RADIUS (METERS) = .2207		
CHORD (INCHES) = 3.592			CHORD (METERS) = .0912			CHORD (INCHES) = 3.618			CHORD (METERS) = .0919		
ZCSL (INCHES) = 1.9194			ZCSL (METERS) = .0488			ZCSL (INCHES) = 1.9330			ZCSL (METERS) = .0491		
YCSL (INCHES) = .3712			YCSL (METERS) = .0094			YCSL (INCHES) = .3509			YCSL (METERS) = .0089		
RLE (INCHES) = .0115			RLE (METERS) = .000292			RLE (INCHES) = .0114			RLE (METERS) = .000290		
RTE (INCHES) = .0118			RTE (METERS) = .000300			RTE (INCHES) = .0118			RTE (METERS) = .000300		
X-AREA (SQ. IN.) = .6730			X-AREA(SQ.METERS)= .000434			X-AREA (SQ. IN.) = .6723			X-AREA(SQ.METERS)= .000434		
GAMMA-CHORD(DEG.)= 15.30			GAMMA-CHORD(RAD.)= .2670			GAMMA-CHORD(DEG.)= 17.01			GAMMA-CHORD(RAD.)= .2968		

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TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)

ZC	YP	YS
.0000	-.0104	.0113
.0105	-.0077	.0162
.1178	.0195	.0654
.2356	.0483	.1171
.3533	.0756	.1657
.4711	.1014	.2114
.5889	.1257	.2543
.7067	.1486	.2943
.8244	.1699	.3316
.9422	.1898	.3662
1.0600	.2081	.3981
1.1778	.2249	.4273
1.2956	.2402	.4538
1.4133	.2539	.4778
1.5311	.2660	.4992
1.6489	.2766	.5180
1.7667	.2856	.5347
1.8844	.2929	.5483
2.0022	.2987	.5587
2.1200	.3015	.5646
2.2378	.3010	.5646
2.3556	.2969	.5587
2.4733	.2893	.5467
2.5911	.2780	.5285
2.7089	.2629	.5038
2.8267	.2439	.4723
2.9445	.2209	.4337
3.0622	.1938	.3875
3.1800	.1624	.3331
3.2978	.1264	.2696
3.4156	.0857	.1961
3.5334	.0399	.1112
3.6412	-.0064	.0217
3.6511	-.0106	.0136

RADIUS (INCHES) = 8.989
CHORD (INCHES) = 3.651
ZCSL (INCHES) = 1.9528
YCSL (INCHES) = .3236
RLE (INCHES) = .0112
RTE (INCHES) = .0118
X-AREA (SQ. IN.) = .6709
GAMMA-CHORD(DEG.) = 19.67

SI Units (Meters)

ZC	YP	YS
.0000	-.0003	.0003
.0003	-.0002	.0004
.0030	.0005	.0017
.0060	.0012	.0030
.0090	.0019	.0042
.0120	.0026	.0054
.0150	.0032	.0065
.0179	.0038	.0075
.0209	.0043	.0084
.0239	.0048	.0093
.0269	.0053	.0101
.0299	.0057	.0109
.0329	.0061	.0115
.0359	.0064	.0121
.0389	.0068	.0127
.0419	.0070	.0132
.0449	.0073	.0136
.0479	.0074	.0139
.0509	.0076	.0142
.0538	.0077	.0143
.0568	.0076	.0143
.0598	.0075	.0142
.0628	.0073	.0139
.0658	.0071	.0134
.0688	.0067	.0128
.0718	.0062	.0120
.0748	.0056	.0110
.0778	.0049	.0098
.0808	.0041	.0085
.0838	.0032	.0068
.0868	.0022	.0050
.0897	.0010	.0028
.0925	-.0002	.0006
.0927	-.0003	.0003

RADIUS (METERS) = .2283
CHORD (METERS) = .0927
ZCSL (METERS) = .0496
YCSL (METERS) = .0082
RLE (METERS) = .000284
RTE (METERS) = .000300
X-AREA(SQ.METERS)= .000433
GAMMA-CHORD(RAD.)= .3433

English Units (Inches)

ZC	YP	YS
.0000	-.0101	.0109
.0104	-.0078	.0153
.1189	.0167	.0614
.2378	.0424	.1096
.3567	.0667	.1550
.4756	.0898	.1978
.5945	.1116	.2379
.7134	.1320	.2754
.8322	.1511	.3104
.9511	.1689	.3428
1.0700	.1853	.3727
1.1889	.2003	.4001
1.3078	.2140	.4251
1.4267	.2263	.4476
1.5456	.2372	.4677
1.6645	.2467	.4854
1.7834	.2548	.5008
1.9023	.2615	.5141
2.0212	.2668	.5243
2.1401	.2696	.5304
2.2590	.2694	.5309
2.3778	.2660	.5257
2.4967	.2593	.5147
2.6156	.2492	.4976
2.7345	.2357	.4744
2.8534	.2187	.4447
2.9723	.1980	.4082
3.0912	.1736	.3645
3.2101	.1453	.3130
3.3290	.1129	.2531
3.4479	.0762	.1839
3.5668	.0350	.1042
3.6756	-.0065	.0207
3.6857	-.0104	.0130

RADIUS (INCHES) = 9.288
CHORD (INCHES) = 3.686
ZCSL (INCHES) = 1.9718
YCSL (INCHES) = .2964
RLE (INCHES) = .0110
RTE (INCHES) = .0117
X-AREA (SQ. IN.) = .6686
GAMMA-CHORD(DEG.) = 22.22

SI Units (Meters)

ZC	YP	YS
.0000	-.0003	.0003
.0003	-.0002	.0004
.0030	.0004	.0016
.0060	.0011	.0028
.0091	.0017	.0039
.0121	.0023	.0050
.0151	.0028	.0060
.0181	.0034	.0070
.0211	.0038	.0079
.0242	.0043	.0087
.0272	.0047	.0095
.0302	.0051	.0102
.0332	.0054	.0108
.0362	.0057	.0114
.0393	.0060	.0119
.0423	.0063	.0123
.0453	.0065	.0127
.0483	.0066	.0131
.0513	.0068	.0133
.0544	.0068	.0135
.0574	.0068	.0134
.0604	.0068	.0131
.0634	.0066	.0126
.0664	.0063	.0120
.0695	.0060	.0120
.0725	.0056	.0113
.0755	.0050	.0104
.0785	.0044	.0093
.0815	.0037	.0080
.0846	.0029	.0064
.0876	.0019	.0047
.0906	.0009	.0026
.0934	-.0002	.0005
.0936	-.0003	.0003

RADIUS (METERS) = .2359
CHORD (METERS) = .0936
ZCSL (METERS) = .0501
YCSL (METERS) = .0075
RLE (METERS) = .000279
RTE (METERS) = .000297
X-AREA(SQ.METERS)= .000431
GAMMA-CHORD(RAD.)= .3878

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

First Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0098	.0104	.0000	-.0002	.0003
.0102	-.0079	.0143	.0003	-.0003	.0003
.1203	.0131	.0563	.0031	.0003	.0014
.2407	.0350	.1002	.0061	.0009	.0025
.3610	.0558	.1416	.0092	.0014	.0036
.4814	.0755	.1806	.0122	.0019	.0046
.6017	.0940	.2173	.0153	.0024	.0055
.7221	.1114	.2515	.0183	.0028	.0064
.8424	.1277	.2835	.0214	.0032	.0072
.9628	.1428	.3132	.0245	.0036	.0080
1.0831	.1568	.3406	.0275	.0040	.0087
1.2035	.1696	.3657	.0306	.0043	.0093
1.3238	.1813	.3886	.0336	.0046	.0099
1.4442	.1917	.4092	.0367	.0049	.0104
1.5645	.2010	.4277	.0397	.0051	.0109
1.6849	.2090	.4439	.0428	.0053	.0113
1.8052	.2159	.4579	.0459	.0055	.0116
1.9256	.2215	.4702	.0489	.0056	.0119
2.0459	.2261	.4796	.0520	.0057	.0122
2.1663	.2286	.4858	.0550	.0058	.0123
2.2866	.2286	.4868	.0581	.0058	.0124
2.4070	.2257	.4823	.0611	.0057	.0122
2.5273	.2200	.4722	.0642	.0056	.0120
2.6477	.2114	.4565	.0673	.0054	.0116
2.7680	.1999	.4350	.0703	.0051	.0110
2.8884	.1853	.4075	.0734	.0047	.0103
3.0087	.1676	.3737	.0764	.0043	.0095
3.1291	.1466	.3332	.0795	.0037	.0085
3.2494	.1224	.2857	.0825	.0031	.0073
3.3698	.0948	.2306	.0856	.0024	.0059
3.4901	.0636	.1672	.0886	.0016	.0042
3.6105	.0287	.0945	.0917	.0007	.0024
3.7208	-.0066	.0188	.0945	-.0002	.0005
3.7308	-.0098	.0120	.0948	-.0002	.0003

English Units (Inches)	SI Units (Meters)
RADIUS (INCHES) = 9.688	RADIUS (METERS) = .2461
CHORD (INCHES) = 3.731	CHORD (METERS) = .0948
ZCSL (INCHES) = 1.9956	ZCSL (METERS) = .0507
YCSL (INCHES) = .2609	YCSL (METERS) = .0066
RLE (INCHES) = .0106	RLE (METERS) = .000269
RTE (INCHES) = .0113	RTE (METERS) = .000287
X-AREA (SQ. IN.) = .6639	X-AREA(SQ.METERS) = .000428
GAMMA-CHORD(DEG.) = 25.43	GAMMA-CHORD(RAD.) = .4438

Second Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0096	.0101	.0000	-.0002	.0003
.0102	-.0079	.0136	.0003	-.0002	.0003
.1214	.0104	.0526	.0031	.0003	.0013
.2428	.0296	.0934	.0062	.0008	.0024
.3641	.0477	.1318	.0092	.0012	.0033
.4855	.0649	.1680	.0123	.0016	.0043
.6069	.0810	.2020	.0154	.0021	.0051
.7283	.0962	.2338	.0185	.0024	.0059
.8497	.1104	.2635	.0216	.0028	.0067
.9710	.1235	.2910	.0247	.0031	.0074
1.0924	.1356	.3164	.0277	.0034	.0080
1.2138	.1467	.3397	.0308	.0037	.0086
1.3352	.1568	.3610	.0339	.0040	.0092
1.4566	.1658	.3802	.0370	.0042	.0097
1.5779	.1739	.3973	.0401	.0044	.0101
1.6993	.1808	.4124	.0432	.0046	.0105
1.8207	.1868	.4255	.0462	.0047	.0108
1.9421	.1916	.4369	.0493	.0049	.0111
2.0635	.1957	.4458	.0524	.0050	.0113
2.1848	.1980	.4520	.0555	.0050	.0115
2.3062	.1982	.4534	.0586	.0050	.0115
2.4276	.1959	.4496	.0617	.0050	.0114
2.5490	.1911	.4404	.0647	.0049	.0112
2.6704	.1837	.4259	.0678	.0047	.0108
2.7917	.1736	.4059	.0709	.0044	.0103
2.9131	.1609	.3801	.0740	.0041	.0097
3.0345	.1454	.3484	.0771	.0037	.0089
3.1559	.1270	.3105	.0802	.0032	.0079
3.2773	.1058	.2660	.0832	.0027	.0068
3.3986	.0816	.2144	.0863	.0021	.0054
3.5200	.0543	.1552	.0894	.0014	.0039
3.6414	.0237	.0876	.0925	.0006	.0022
3.7527	-.0068	.0179	.0953	-.0002	.0005
3.7628	-.0096	.0115	.0956	-.0002	.0003

English Units (Inches)	SI Units (Meters)
RADIUS (INCHES) = 9.987	RADIUS (METERS) = .2537
CHORD (INCHES) = 3.763	CHORD (METERS) = .0956
ZCSL (INCHES) = 2.0129	ZCSL (METERS) = .0511
YCSL (INCHES) = .2344	YCSL (METERS) = .0060
RLE (INCHES) = .0104	RLE (METERS) = .000264
RTE (INCHES) = .0111	RTE (METERS) = .000282
X-AREA (SQ. IN.) = .6594	X-AREA(SQ.METERS) = .000425
GAMMA-CHORD(DEG.) = 27.75	GAMMA-CHORD(RAD.) = .4843

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

Section 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0093	.0098	.0000	-.0002	.0002
.0079	.0079	.0130	.0003	-.0002	.0003
.1224	.0081	.0493	.0031	-.0002	.0013
.2448	.0247	.0872	.0062	.0006	.0022
.3672	.0405	.1229	.0093	.0010	.0031
.4896	.0553	.1565	.0124	.0014	.0040
.6120	.0693	.1881	.0155	.0018	.0048
.7344	.0824	.2176	.0187	.0021	.0055
.8568	.0945	.2451	.0218	.0024	.0062
.9792	.1058	.2706	.0249	.0027	.0069
1.1016	.1162	.2941	.0280	.0030	.0075
1.2240	.1256	.3157	.0311	.0032	.0080
1.3464	.1342	.3353	.0342	.0034	.0085
1.4688	.1418	.3531	.0373	.0036	.0090
1.5912	.1486	.3689	.0404	.0038	.0094
1.7136	.1544	.3828	.0435	.0039	.0097
1.8360	.1594	.3948	.0466	.0040	.0100
1.9584	.1634	.4051	.0497	.0041	.0103
2.0808	.1666	.4133	.0529	.0042	.0105
2.2032	.1686	.4192	.0560	.0043	.0106
2.3256	.1688	.4208	.0591	.0043	.0107
2.4480	.1668	.4174	.0622	.0042	.0106
2.5704	.1627	.4090	.0653	.0041	.0104
2.6929	.1563	.3955	.0684	.0040	.0100
2.8152	.1476	.3768	.0715	.0037	.0096
2.9377	.1366	.3527	.0746	.0035	.0090
3.0600	.1233	.3232	.0777	.0031	.0082
3.1825	.1075	.2878	.0808	.0027	.0073
3.3049	.0893	.2463	.0839	.0023	.0063
3.4273	.0685	.1983	.0871	.0017	.0050
3.5497	.0451	.1435	.0902	.0011	.0036
3.6721	.0190	.0811	.0933	.0005	.0021
3.7844	-.0070	.0168	.0961	-.0002	.0004
3.7945	-.0094	.0110	.0964	-.0002	.0003

RADIUS (INCHES) = 10.287 RADIUS (METERS) = .2613
CHORD (INCHES) = 3.795 CHORD (METERS) = .0964
ZCSL (INCHES) = 2.0296 ZCSL (METERS) = .0516
YCSL (INCHES) = .2086 YCSL (METERS) = .0053
RLE (INCHES) = .0102 RLE (METERS) = .000259
RTE (INCHES) = .0109 RTE (METERS) = .000277
X-AREA (SQ. IN.) = .6547 X-AREA(SQ.METERS) = .000422
GAMMA-CHORD(DEG.) = 29.96 GAMMA-CHORD(RAD.) = .5229

Section 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0090	.0094	.0000	-.0002	.0002
.0096	-.0078	.0122	.0002	-.0002	.0003
.1237	.0057	.0458	.0031	.0001	.0012
.2475	.0196	.0805	.0063	.0005	.0020
.3712	.0328	.1132	.0094	.0008	.0029
.4950	.0451	.1440	.0126	.0011	.0037
.6187	.0567	.1729	.0157	.0014	.0044
.7425	.0674	.1998	.0189	.0017	.0051
.8662	.0773	.2248	.0220	.0020	.0057
.9899	.0864	.2480	.0251	.0022	.0063
1.1137	.0947	.2693	.0283	.0024	.0068
1.2374	.1022	.2887	.0314	.0026	.0073
1.3612	.1089	.3063	.0346	.0028	.0078
1.4849	.1148	.3221	.0377	.0029	.0082
1.6087	.1199	.3362	.0409	.0030	.0085
1.7324	.1243	.3484	.0440	.0032	.0088
1.8562	.1278	.3589	.0471	.0032	.0091
1.9799	.1305	.3677	.0503	.0033	.0093
2.1036	.1326	.3747	.0534	.0034	.0095
2.2274	.1337	.3798	.0566	.0034	.0096
2.3511	.1334	.3812	.0597	.0034	.0097
2.4749	.1315	.3780	.0629	.0033	.0096
2.5986	.1279	.3702	.0660	.0032	.0094
2.7224	.1225	.3577	.0691	.0031	.0091
2.8461	.1153	.3405	.0723	.0029	.0086
2.9699	.1064	.3184	.0754	.0027	.0081
3.0936	.0956	.2913	.0786	.0024	.0074
3.2173	.0830	.2590	.0817	.0021	.0066
3.3411	.0685	.2213	.0849	.0017	.0056
3.4648	.0521	.1778	.0880	.0013	.0045
3.5886	.0337	.1284	.0911	.0009	.0033
3.7123	.0133	.0725	.0943	.0003	.0018
3.8263	-.0070	.0150	.0972	-.0002	.0004
3.8361	-.0088	.0101	.0974	-.0002	.0003

RADIUS (INCHES) = 10.686 RADIUS (METERS) = .2714
CHORD (INCHES) = 3.836 CHORD (METERS) = .0974
ZCSL (INCHES) = 2.0500 ZCSL (METERS) = .0521
YCSL (INCHES) = .1779 YCSL (METERS) = .0045
RLE (INCHES) = .0098 RLE (METERS) = .000249
RTE (INCHES) = .0103 RTE (METERS) = .000262
X-AREA (SQ. IN.) = .6485 X-AREA(SQ.METERS) = .000418
GAMMA-CHORD(DEG.) = 32.73 GAMMA-CHORD(RAD.) = .5713

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

Station 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0087	.0091	.0000	-.0002	.0002
.0093	-.0077	.0116	.0002	-.0002	.0003
.1247	-.0039	.0430	.0032	-.0001	.0011
.2494	.0157	.0754	.0063	.0004	.0019
.3742	.0269	.1059	.0095	.0007	.0027
.4989	.0372	.1345	.0127	.0009	.0034
.6236	.0469	.1613	.0158	.0012	.0041
.7483	.0558	.1863	.0190	.0014	.0047
.8730	.0640	.2095	.0222	.0016	.0053
.9978	.0714	.2309	.0253	.0018	.0059
1.1225	.0781	.2505	.0285	.0020	.0064
1.2472	.0841	.2584	.0317	.0021	.0068
1.3719	.0894	.2846	.0348	.0023	.0072
1.4967	.0940	.2990	.0380	.0024	.0076
1.6214	.0979	.3118	.0412	.0025	.0079
1.7461	.1011	.3229	.0444	.0026	.0082
1.8708	.1036	.3323	.0475	.0026	.0084
1.9955	.1054	.3401	.0507	.0027	.0086
2.1203	.1066	.3462	.0539	.0027	.0088
2.2450	.1070	.3508	.0570	.0027	.0089
2.3697	.1063	.3518	.0602	.0027	.0089
2.4944	.1044	.3488	.0634	.0027	.0089
2.6192	.1012	.3415	.0645	.0026	.0087
2.7439	.0966	.3299	.0697	.0025	.0084
2.8686	.0906	.3138	.0729	.0023	.0080
2.9933	.0832	.2932	.0760	.0021	.0074
3.1180	.0744	.2680	.0792	.0019	.0068
3.2428	.0642	.2380	.0824	.0016	.0060
3.3675	.0526	.2031	.0855	.0013	.0052
3.4922	.0395	.1630	.0887	.0010	.0041
3.6169	.0250	.1175	.0919	.0006	.0030
3.7417	.0089	.0662	.0950	.0002	.0017
3.8570	-.0070	.0138	.0980	-.0002	.0003
3.8664	-.0084	.0095	.0982	-.0002	.0002

	English Units		SI Units	
RADIUS	(INCHES) =	10.985	(METERS) =	.2790
CHORD	(INCHES) =	3.866	(METERS) =	.0982
ZCSL	(INCHES) =	2.0662	(METERS) =	.0525
YCSL	(INCHES) =	.1547	(METERS) =	.0039
RLE	(INCHES) =	.0095	(METERS) =	.000241
RTE	(INCHES) =	.0099	(METERS) =	.000251
X-AREA	(SQ. IN.) =	.6458	(SQ.METERS)=	.000417
GAMMA-CHORD(DEG.)=		34.72	(RAD.)=	.6059

Station 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0083	.0086	.0000	-.0002	.0002
.0089	-.0074	.0107	.0002	-.0002	.0003
.1266	-.0009	.0386	.0032	-.0000	.0010
.2533	.0096	.0671	.0064	.0002	.0017
.3799	.0176	.0939	.0097	.0004	.0024
.5066	.0250	.1189	.0129	.0006	.0030
.6332	.0317	.1422	.0161	.0008	.0036
.7599	.0378	.1639	.0193	.0010	.0042
.8865	.0433	.1840	.0225	.0011	.0047
1.0132	.0481	.2024	.0257	.0012	.0051
1.1398	.0522	.2192	.0290	.0013	.0056
1.2665	.0558	.2343	.0322	.0014	.0060
1.3931	.0587	.2479	.0354	.0015	.0063
1.5198	.0610	.2599	.0386	.0015	.0066
1.6464	.0626	.2703	.0418	.0016	.0069
1.7730	.0637	.2791	.0450	.0016	.0071
1.8997	.0642	.2863	.0483	.0016	.0073
2.0263	.0642	.2921	.0515	.0016	.0074
2.1530	.0635	.2964	.0547	.0016	.0075
2.2796	.0623	.2993	.0579	.0016	.0076
2.4063	.0605	.2994	.0611	.0015	.0076
2.5329	.0581	.2963	.0643	.0015	.0075
2.6596	.0551	.2895	.0676	.0014	.0074
2.7862	.0515	.2791	.0708	.0013	.0071
2.9129	.0473	.2649	.0740	.0012	.0067
3.0395	.0424	.2469	.0772	.0011	.0063
3.1662	.0370	.2251	.0804	.0009	.0057
3.2928	.0310	.1994	.0836	.0008	.0051
3.4195	.0243	.1697	.0867	.0006	.0043
3.5461	.0171	.1359	.0901	.0004	.0035
3.6727	.0093	.0978	.0933	.0002	.0025
3.7994	.0009	.0554	.0965	.0000	.0014
3.9170	-.0072	.0120	.0997	-.0002	.0003
3.9260	-.0079	.0087	.0997	-.0002	.0002

	English Units		SI Units	
RADIUS	(INCHES) =	11.584	(METERS) =	.2942
CHORD	(INCHES) =	3.926	(METERS) =	.0997
ZCSL	(INCHES) =	2.0976	(METERS) =	.0533
YCSL	(INCHES) =	.1141	(METERS) =	.0029
RLE	(INCHES) =	.0091	(METERS) =	.000231
RTE	(INCHES) =	.0093	(METERS) =	.000236
X-AREA	(SQ. IN.) =	.6361	(SQ.METERS)=	.000410
GAMMA-CHORD(DEG.)=		37.93	(RAD.)=	.6620

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — ROTOR 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0080	.0083	.0000	-.0002	.0002
.0086	-.0074	.0102	.0002	-.0002	.0003
.1279	-.0003	.0370	.0032	-.0000	.0009
.2557	.0079	.0643	.0065	.0002	.0016
.3836	.0148	.0898	.0097	.0004	.0023
.5115	.0210	.1137	.0130	.0005	.0029
.6393	.0265	.1358	.0162	.0007	.0034
.7672	.0313	.1563	.0195	.0008	.0040
.8951	.0355	.1750	.0227	.0009	.0044
1.0230	.0390	.1922	.0260	.0010	.0049
1.1508	.0419	.2077	.0292	.0011	.0053
1.2787	.0442	.2216	.0325	.0011	.0056
1.4066	.0459	.2339	.0357	.0012	.0059
1.5344	.0469	.2446	.0390	.0012	.0062
1.6623	.0474	.2537	.0422	.0012	.0064
1.7902	.0472	.2613	.0455	.0012	.0066
1.9181	.0465	.2673	.0487	.0012	.0068
2.0459	.0452	.2718	.0520	.0011	.0069
2.1738	.0434	.2748	.0552	.0011	.0070
2.3017	.0408	.2764	.0585	.0010	.0070
2.4295	.0380	.2757	.0617	.0010	.0070
2.5574	.0349	.2722	.0650	.0009	.0069
2.6853	.0317	.2654	.0682	.0008	.0067
2.8131	.0283	.2552	.0715	.0007	.0065
2.9410	.0248	.2417	.0747	.0007	.0061
3.0689	.0211	.2249	.0779	.0006	.0057
3.1968	.0173	.2046	.0812	.0005	.0052
3.3246	.0134	.1808	.0844	.0004	.0046
3.4525	.0094	.1535	.0877	.0003	.0039
3.5804	.0053	.1227	.0909	.0002	.0031
3.7082	.0011	.0861	.0942	.0001	.0022
3.8361	-.0031	.0498	.0974	-.0001	.0013
3.9555	-.0070	.0107	.1005	-.0002	.0003
3.9640	-.0073	.0079	.1007	-.0002	.0002

RADIUS (INCHES) = 11.984	RADIUS (METERS) = .3044
CHORD (INCHES) = 3.964	CHORD (METERS) = .1007
ZCSL (INCHES) = 2.1231	ZCSL (METERS) = .0539
YCSL (INCHES) = .0951	YCSL (METERS) = .0024
RLE (INCHES) = .0087	RLE (METERS) = .000221
RTE (INCHES) = .0086	RTE (METERS) = .000218
X-AREA (SQ. IN.) = .6376	X-AREA(SQ.METERS)= .000411
GAMMA-CHORD(DEG.) = 39.51	GAMMA-CHORD(RAD.)= .6895

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0074	.0077	.0000	-.0002	.0002
.0079	-.0069	.0093	.0002	-.0002	.0002
.1299	-.0003	.0340	.0033	-.0000	.0009
.2598	.0072	.0589	.0066	.0002	.0015
.3897	.0133	.0821	.0099	.0003	.0021
.5196	.0185	.1036	.0132	.0005	.0026
.6495	.0229	.1234	.0165	.0006	.0031
.7794	.0265	.1415	.0198	.0007	.0036
.9093	.0295	.1580	.0231	.0007	.0040
1.0392	.0317	.1729	.0264	.0008	.0044
1.1691	.0332	.1862	.0297	.0008	.0047
1.2990	.0340	.1980	.0330	.0009	.0050
1.4289	.0341	.2082	.0363	.0009	.0053
1.5588	.0337	.2168	.0396	.0009	.0055
1.6887	.0326	.2240	.0429	.0008	.0057
1.8186	.0309	.2296	.0462	.0008	.0058
1.9485	.0286	.2337	.0495	.0007	.0059
2.0784	.0257	.2363	.0528	.0007	.0060
2.2083	.0222	.2374	.0561	.0006	.0060
2.3382	.0180	.2370	.0594	.0005	.0060
2.4681	.0135	.2350	.0627	.0003	.0060
2.5980	.0092	.2307	.0660	.0002	.0059
2.7279	.0054	.2238	.0693	.0001	.0057
2.8578	.0020	.2142	.0726	.0001	.0054
2.9877	-.0009	.2021	.0759	-.0000	.0051
3.1176	-.0034	.1872	.0792	-.0001	.0048
3.2475	-.0055	.1697	.0825	-.0001	.0043
3.3774	-.0070	.1495	.0858	-.0002	.0038
3.5073	-.0081	.1266	.0891	-.0002	.0032
3.6372	-.0087	.1009	.0924	-.0002	.0026
3.7671	-.0087	.0725	.0957	-.0002	.0018
3.8970	-.0082	.0413	.0990	-.0002	.0010
4.0187	-.0072	.0096	.1021	-.0002	.0002
4.0269	-.0071	.0075	.1023	-.0002	.0002

RADIUS (INCHES) = 12.621	RADIUS (METERS) = .3206
CHORD (INCHES) = 4.027	CHORD (METERS) = .1023
ZCSL (INCHES) = 2.1563	ZCSL (METERS) = .0548
YCSL (INCHES) = .0675	YCSL (METERS) = .0017
RLE (INCHES) = .0080	RLE (METERS) = .000203
RTE (INCHES) = .0083	RTE (METERS) = .000211
X-AREA (SQ. IN.) = .6020	X-AREA(SQ.METERS)= .000388
GAMMA-CHORD(DEG.) = 41.40	GAMMA-CHORD(RAD.)= .7226

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TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)

ZC	YP	YS
.0000	-.0074	.0077
.0079	-.0069	.0093
.1304	-.0014	.0338
.2609	-.0093	.0585
.3913	-.0163	.0814
.5218	-.0222	.1027
.6522	-.0273	.1222
.7827	-.0314	.1400
.9131	-.0346	.1562
1.0436	-.0370	.1706
1.1740	-.0386	.1834
1.3045	-.0393	.1946
1.4349	-.0392	.2041
1.5654	-.0383	.2120
1.6958	-.0367	.2183
1.8263	-.0343	.2230
1.9567	-.0311	.2261
2.0872	-.0273	.2275
2.2176	-.0226	.2275
2.3481	-.0172	.2259
2.4785	-.0114	.2226
2.6090	-.0057	.2173
2.7394	-.0008	.2097
2.8699	-.0034	.1998
3.0003	-.0069	.1876
3.1308	-.0097	.1731
3.2612	-.0116	.1563
3.3916	-.0129	.1372
3.5221	-.0133	.1158
3.6525	-.0129	.0921
3.7830	-.0118	.0661
3.9134	-.0097	.0378
4.0360	-.0071	.0090
4.0439	-.0070	.0072

RADIUS (INCHES) = 12.859
CHORD (INCHES) = 4.044
ZCSL (INCHES) = 2.1691
YCSL (INCHES) = .0618
RLE (INCHES) = .0080
RTE (INCHES) = .0080
X-AREA (SQ. IN.) = .5758
GAMMA-CHORD(DEG.)= 42.09

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0002	.0002
.0033	.0000	.0009
.0066	.0002	.0015
.0099	.0004	.0021
.0133	.0006	.0026
.0166	.0007	.0031
.0199	.0008	.0036
.0232	.0009	.0040
.0265	.0009	.0043
.0298	.0010	.0047
.0331	.0010	.0049
.0364	.0010	.0052
.0398	.0010	.0054
.0431	.0009	.0055
.0464	.0009	.0057
.0497	.0008	.0057
.0530	.0007	.0058
.0563	.0006	.0058
.0596	.0004	.0057
.0630	.0003	.0057
.0663	.0001	.0055
.0696	.0000	.0053
.0729	-.0001	.0051
.0762	-.0002	.0048
.0795	-.0002	.0044
.0828	-.0003	.0040
.0861	-.0003	.0035
.0895	-.0003	.0029
.0928	-.0003	.0023
.0961	-.0003	.0017
.0994	-.0002	.0010
.1025	-.0002	.0002
.1027	-.0002	.0002

RADIUS (METERS) = .3266
CHORD (METERS) = .1027
ZCSL (METERS) = .0551
YCSL (METERS) = .0016
RLE (METERS) = .000203
RTE (METERS) = .000203
X-AREA(SQ.METERS)= .000372
GAMMA-CHORD(RAD.)= .7346

English Units (Inches)

ZC	YP	YS
.0000	-.0073	.0075
.0077	-.0068	.0088
.1314	-.0020	.0302
.2628	.0105	.0518
.3942	.0181	.0719
.5256	.0248	.0906
.6570	.0306	.1078
.7884	.0354	.1236
.9198	.0394	.1378
1.0511	.0425	.1506
1.1825	.0447	.1619
1.3139	.0461	.1717
1.4453	.0466	.1800
1.5767	.0463	.1868
1.7081	.0452	.1922
1.8395	.0433	.1961
1.9709	.0406	.1985
2.1023	.0372	.1995
2.2337	.0330	.1991
2.3651	.0281	.1973
2.4965	.0227	.1942
2.6279	.0171	.1892
2.7593	.0121	.1823
2.8907	.0076	.1735
3.0221	.0036	.1626
3.1534	.0002	.1499
3.2848	-.0026	.1352
3.4162	-.0048	.1186
3.5476	-.0065	.1001
3.6790	-.0075	.0797
3.8104	-.0080	.0575
3.9418	-.0078	.0333
4.0653	-.0072	.0089
4.0732	-.0071	.0073

RADIUS (INCHES) = 13.239
CHORD (INCHES) = 4.073
ZCSL (INCHES) = 2.1875
YCSL (INCHES) = .0518
RLE (INCHES) = .0077
RTE (INCHES) = .0080
X-AREA (SQ. IN.) = .4734
GAMMA-CHORD(DEG.)= 44.09

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0002	.0002
.0033	.0001	.0008
.0067	.0003	.0013
.0100	.0005	.0018
.0133	.0006	.0023
.0167	.0008	.0027
.0200	.0009	.0031
.0234	.0010	.0035
.0267	.0011	.0038
.0300	.0011	.0041
.0334	.0012	.0044
.0367	.0012	.0046
.0400	.0012	.0047
.0434	.0011	.0049
.0467	.0011	.0050
.0501	.0010	.0050
.0534	.0009	.0051
.0567	.0008	.0051
.0601	.0007	.0050
.0634	.0006	.0049
.0667	.0004	.0048
.0701	.0003	.0046
.0734	.0002	.0044
.0768	.0001	.0041
.0801	.0000	.0038
.0834	-.0001	.0034
.0868	-.0001	.0030
.0901	-.0002	.0025
.0934	-.0002	.0020
.0968	-.0002	.0015
.1001	-.0002	.0008
.1033	-.0002	.0002
.1035	-.0002	.0002

RADIUS (METERS) = .3363
CHORD (METERS) = .1035
ZCSL (METERS) = .0556
YCSL (METERS) = .0013
RLE (METERS) = .000196
RTE (METERS) = .000203
X-AREA(SQ.METERS)= .000305
GAMMA-CHORD(RAD.)= .7695

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)

ZC	YP	YS
.0000	-.0071	.0072
.0074	-.0067	.0083
.1324	-.0063	.0260
.2647	.0071	.0438
.3971	.0134	.0605
.5294	.0190	.0761
.6618	.0240	.0905
.7941	.0283	.1038
.9265	.0319	.1158
1.0589	.0349	.1267
1.1912	.0372	.1364
1.3236	.0389	.1449
1.4559	.0399	.1522
1.5883	.0403	.1583
1.7206	.0401	.1632
1.8530	.0393	.1670
1.9854	.0379	.1696
2.1177	.0359	.1712
2.2501	.0335	.1717
2.3824	.0305	.1711
2.5148	.0270	.1695
2.6471	.0234	.1664
2.7795	.0198	.1614
2.9119	.0163	.1544
3.0442	.0130	.1456
3.1766	.0098	.1348
3.3089	.0068	.1222
3.4413	.0039	.1077
3.5736	.0013	.0913
3.7060	-.0011	.0730
3.8384	-.0033	.0529
3.9707	-.0053	.0310
4.0954	-.0069	.0086
4.1031	-.0070	.0072

RADIUS (INCHES) = 13.572
CHORD (INCHES) = 4.103
ZCSL (INCHES) = 2.1949
YCSL (INCHES) = .0393
RLE (INCHES) = .0075
RTE (INCHES) = .0077
X-AREA (SQ. IN.) = .4015
GAMMA-CHORD(DEG.)= 46.20

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0002	.0002
.0034	-.0000	.0007
.0067	.0002	.0011
.0101	.0003	.0015
.0134	.0005	.0019
.0168	.0006	.0023
.0202	.0007	.0026
.0235	.0008	.0029
.0269	.0009	.0032
.0303	.0009	.0035
.0336	.0010	.0037
.0370	.0010	.0039
.0403	.0010	.0040
.0437	.0010	.0041
.0471	.0010	.0042
.0504	.0010	.0043
.0538	.0009	.0043
.0572	.0009	.0044
.0605	.0008	.0043
.0639	.0007	.0043
.0672	.0006	.0042
.0706	.0005	.0041
.0740	.0004	.0039
.0773	.0003	.0037
.0807	.0002	.0034
.0840	.0002	.0031
.0874	.0001	.0027
.0908	.0000	.0023
.0941	-.0000	.0019
.0975	-.0001	.0013
.1009	-.0001	.0008
.1040	-.0002	.0002
.1042	-.0002	.0002

RADIUS (METERS) = .3447
CHORD (METERS) = .1042
ZCSL (METERS) = .0558
YCSL (METERS) = .0010
RLE (METERS) = .000190
RTE (METERS) = .000196
X-AREA(SQ.METERS)= .000259
GAMMA-CHORD(RAD.)= .8064

English Units (Inches)

ZC	YP	YS
.0000	-.0070	.0071
.0073	-.0067	.0079
.1331	-.0014	.0233
.2662	.0039	.0388
.3993	.0088	.0535
.5323	.0133	.0672
.6654	.0174	.0799
.7985	.0209	.0917
.9316	.0241	.1024
1.0647	.0268	.1122
1.1978	.0289	.1209
1.3309	.0304	.1286
1.4639	.0315	.1354
1.5970	.0321	.1411
1.7301	.0323	.1460
1.8632	.0321	.1499
1.9963	.0315	.1530
2.1294	.0306	.1552
2.2625	.0294	.1566
2.3955	.0278	.1571
2.5286	.0260	.1571
2.6617	.0240	.1555
2.7948	.0217	.1520
2.9279	.0193	.1465
3.0610	.0167	.1390
3.1941	.0140	.1294
3.3272	.0112	.1179
3.4602	.0084	.1043
3.5933	.0054	.0888
3.7264	.0024	.0713
3.8595	-.0007	.0518
3.9926	-.0037	.0303
4.1184	-.0066	.0083
4.1257	-.0067	.0070

RADIUS (INCHES) = 13.810
CHORD (INCHES) = 4.126
ZCSL (INCHES) = 2.2017
YCSL (INCHES) = .0308
RLE (INCHES) = .0073
RTE (INCHES) = .0074
X-AREA (SQ. IN.) = .3739
GAMMA-CHORD(DEG.)= 47.78

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0002	.0002
.0034	-.0000	.0006
.0068	.0001	.0010
.0101	.0002	.0014
.0135	.0003	.0017
.0169	.0004	.0020
.0203	.0005	.0023
.0237	.0006	.0026
.0270	.0007	.0029
.0304	.0007	.0031
.0338	.0008	.0033
.0372	.0008	.0034
.0406	.0008	.0036
.0439	.0008	.0037
.0473	.0008	.0038
.0507	.0008	.0039
.0541	.0008	.0039
.0575	.0007	.0040
.0608	.0007	.0040
.0642	.0007	.0040
.0676	.0006	.0039
.0710	.0006	.0039
.0744	.0005	.0037
.0777	.0004	.0035
.0811	.0004	.0033
.0845	.0003	.0030
.0879	.0002	.0026
.0913	.0001	.0023
.0947	.0001	.0018
.0980	-.0000	.0013
.1014	-.0001	.0008
.1046	-.0002	.0002
.1048	-.0002	.0002

RADIUS (METERS) = .3508
CHORD (METERS) = .1048
ZCSL (METERS) = .0559
YCSL (METERS) = .0008
RLE (METERS) = .000185
RTE (METERS) = .000188
X-AREA(SQ.METERS)= .000241
GAMMA-CHORD(RAD.)= .8339

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0068	.0068	.0000	-.0002	.0002
.0071	-.0068	.0074	.0002	-.0002	.0002
.1350	-.0070	.0169	.0034	-.0002	.0004
.2700	-.0072	.0267	.0069	-.0002	.0007
.4050	-.0072	.0360	.0103	-.0002	.0009
.5400	-.0072	.0450	.0137	-.0002	.0011
.6750	-.0070	.0535	.0171	-.0002	.0014
.8101	-.0068	.0616	.0206	-.0002	.0016
.9451	-.0065	.0693	.0240	-.0002	.0018
1.0801	-.0061	.0766	.0274	-.0002	.0019
1.2151	-.0056	.0834	.0309	-.0001	.0021
1.3501	-.0051	.0899	.0343	-.0001	.0023
1.4851	-.0044	.0959	.0377	-.0001	.0024
1.6201	-.0037	.1016	.0412	-.0001	.0026
1.7551	-.0028	.1069	.0446	-.0001	.0027
1.8901	-.0018	.1118	.0480	-.0000	.0028
2.0252	-.0007	.1164	.0514	-.0000	.0030
2.1602	.0006	.1206	.0549	.0000	.0031
2.2952	.0020	.1244	.0583	.0001	.0032
2.4302	.0035	.1280	.0617	.0001	.0033
2.5652	.0054	.1316	.0652	.0001	.0033
2.7002	.0072	.1338	.0686	.0002	.0034
2.8352	.0085	.1342	.0720	.0002	.0034
2.9702	.0093	.1322	.0754	.0002	.0034
3.1052	.0095	.1278	.0789	.0002	.0032
3.2403	.0092	.1210	.0823	.0002	.0031
3.3753	.0083	.1118	.0857	.0002	.0028
3.5103	.0070	.1003	.0892	.0002	.0025
3.6453	.0052	.0863	.0926	.0001	.0022
3.7803	.0029	.0700	.0960	.0001	.0018
3.9153	.0002	.0512	.0994	.0000	.0013
4.0503	-.0029	.0300	.1029	-.0001	.0008
4.1783	-.0063	.0079	.1061	-.0002	.0002
4.1853	-.0064	.0067	.1063	-.0002	.0002

RADIUS (INCHES) =	14.481		RADIUS (METERS) =	.3678	
CHORD (INCHES) =	4.185		CHORD (METERS) =	.1063	
ZCSL (INCHES) =	2.2314		ZCSL (METERS) =	.0567	
YCSL (INCHES) =	.0046		YCSL (METERS) =	.0001	
RLE (INCHES) =	.0071		RLE (METERS) =	.000180	
RTE (INCHES) =	.0070		RTE (METERS) =	.000178	
X-AREA (SQ. IN.) =	.3667		X-AREA(SQ.METERS)=	.000237	
GAMMA-CHORD(DEG.)=	51.11		GAMMA-CHORD(RAD.)=	.8920	

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0068	.0067	.0000	-.0002	.0002
.0070	-.0070	.0071	.0002	-.0002	.0002
.1384	-.0092	.0146	.0035	-.0002	.0004
.2728	-.0114	.0223	.0069	-.0003	.0006
.4092	-.0133	.0298	.0104	-.0003	.0008
.5456	-.0149	.0371	.0139	-.0004	.0009
.6820	-.0162	.0441	.0173	-.0004	.0011
.8184	-.0173	.0509	.0208	-.0004	.0013
.9548	-.0181	.0575	.0243	-.0005	.0015
1.0912	-.0186	.0638	.0277	-.0005	.0016
1.2276	-.0189	.0700	.0312	-.0005	.0018
1.3640	-.0189	.0759	.0346	-.0005	.0019
1.5004	-.0187	.0815	.0381	-.0005	.0021
1.6368	-.0181	.0870	.0416	-.0005	.0022
1.7732	-.0173	.0923	.0450	-.0004	.0023
1.9096	-.0162	.0974	.0485	-.0004	.0025
2.0460	-.0148	.1022	.0520	-.0004	.0026
2.1824	-.0131	.1069	.0554	-.0003	.0027
2.3188	-.0111	.1113	.0589	-.0003	.0028
2.4551	-.0087	.1157	.0624	-.0002	.0029
2.5915	-.0059	.1203	.0658	-.0001	.0031
2.7279	-.0030	.1238	.0693	-.0001	.0031
2.8644	-.0004	.1256	.0728	-.0000	.0032
3.0007	.0015	.1250	.0762	.0000	.0032
3.1371	.0028	.1218	.0797	.0001	.0031
3.2735	.0035	.1161	.0831	.0001	.0029
3.4099	.0036	.1079	.0866	.0001	.0027
3.5463	.0032	.0973	.0901	.0001	.0025
3.6827	.0023	.0841	.0935	.0001	.0021
3.8191	.0008	.0685	.0970	.0000	.0017
3.9555	-.0012	.0503	.1005	-.0001	.0013
4.0919	-.0036	.0296	.1039	-.0001	.0008
4.2213	-.0063	.0079	.1072	-.0002	.0002
4.2283	-.0064	.0067	.1074	-.0002	.0002

RADIUS (INCHES) =	14.981		RADIUS (METERS) =	.3805	
CHORD (INCHES) =	4.228		CHORD (METERS) =	.1074	
ZCSL (INCHES) =	2.2564		ZCSL (METERS) =	.0573	
YCSL (INCHES) =	-.0081		YCSL (METERS) =	-.0002	
RLE (INCHES) =	.0070		RLE (METERS) =	.000178	
RTE (INCHES) =	.0070		RTE (METERS) =	.000178	
X-AREA (SQ. IN.) =	.3709		X-AREA(SQ.METERS)=	.000239	
GAMMA-CHORD(DEG.)=	52.78		GAMMA-CHORD(RAD.)=	.9212	

TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — ROTOR 1

Left Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0069	.0065	.0000	-.0002	.0002
.0070	-.0070	.0069	.0002	-.0002	.0002
.1378	-.0103	.0135	.0035	-.0003	.0003
.2755	-.0135	.0203	.0070	-.0003	.0005
.4133	-.0163	.0269	.0105	-.0004	.0007
.5511	-.0188	.0333	.0140	-.0005	.0008
.6888	-.0209	.0395	.0175	-.0005	.0010
.8266	-.0227	.0456	.0210	-.0006	.0012
.9644	-.0242	.0516	.0245	-.0006	.0013
1.1022	-.0252	.0575	.0280	-.0006	.0015
1.2399	-.0259	.0633	.0315	-.0007	.0016
1.3777	-.0263	.0689	.0350	-.0007	.0018
1.5155	-.0262	.0744	.0385	-.0007	.0019
1.6532	-.0258	.0798	.0420	-.0007	.0020
1.7910	-.0249	.0851	.0455	-.0006	.0022
1.9288	-.0237	.0904	.0490	-.0006	.0023
2.0666	-.0220	.0956	.0525	-.0006	.0024
2.2043	-.0199	.1007	.0560	-.0005	.0026
2.3421	-.0173	.1058	.0595	-.0004	.0027
2.4799	-.0142	.1110	.0630	-.0004	.0028
2.6176	-.0104	.1163	.0665	-.0003	.0030
2.7554	-.0065	.1212	.0700	-.0002	.0031
2.8932	-.0028	.1248	.0735	-.0001	.0032
3.0310	.0003	.1255	.0770	.0000	.0032
3.1687	.0026	.1234	.0805	.0001	.0031
3.3065	.0042	.1186	.0840	.0001	.0030
3.4443	.0050	.1111	.0875	.0001	.0028
3.5820	.0051	.1008	.0910	.0001	.0026
3.7198	.0044	.0878	.0945	.0001	.0022
3.8576	.0030	.0718	.0980	.0001	.0018
3.9954	-.0007	.0530	.1015	.0000	.0013
4.1331	-.0024	.0313	.1050	-.0001	.0008
4.2639	-.0062	.0079	.1083	-.0002	.0002
4.2709	-.0064	.0067	.1085	-.0002	.0002

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RADIUS (INCHES)    = 15.481      RADIUS (METERS)   = .3932
CHORD  (INCHES)    = 4.271       CHORD  (METERS)   = .1085
ZCSL   (INCHES)    = 2.2823      ZCSL   (METERS)   = .0580
YCSL   (INCHES)    = -.0142      YCSL   (METERS)   = -.0004
RLE    (INCHES)    = .0070       RLE    (METERS)   = .000178
RTE    (INCHES)    = .0070       RTE    (METERS)   = .000178
X-AREA (SQ. IN.)   = .3777       X-AREA(SQ.METERS) = .000244
GAMMA-CHORD(DEG.)  = 54.23       GAMMA-CHORD(RAD.) = .9464
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Right Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0069	.0068	.0000	-.0002	.0002
.0071	-.0070	.0071	.0002	-.0002	.0002
.1392	-.0105	.0136	.0035	-.0003	.0003
.2783	-.0139	.0203	.0071	-.0004	.0005
.4175	-.0168	.0269	.0106	-.0004	.0007
.5566	-.0192	.0334	.0141	-.0005	.0008
.6958	-.0212	.0399	.0177	-.0005	.0010
.8349	-.0228	.0464	.0212	-.0006	.0012
.9741	-.0239	.0528	.0247	-.0006	.0013
1.1133	-.0245	.0593	.0283	-.0006	.0015
1.2524	-.0246	.0656	.0318	-.0006	.0017
1.3916	-.0242	.0720	.0353	-.0006	.0018
1.5307	-.0234	.0784	.0389	-.0006	.0020
1.6699	-.0220	.0848	.0424	-.0006	.0022
1.8090	-.0201	.0912	.0459	-.0005	.0023
1.9482	-.0176	.0978	.0495	-.0004	.0025
2.0874	-.0145	.1043	.0530	-.0004	.0027
2.2265	-.0109	.1110	.0566	-.0003	.0028
2.3657	-.0067	.1179	.0601	-.0002	.0030
2.5048	-.0018	.1248	.0636	-.0000	.0032
2.6440	.0040	.1325	.0672	.0001	.0034
2.7832	.0102	.1395	.0707	.0003	.0035
2.9223	.0159	.1450	.0742	.0004	.0037
3.0615	.0204	.1473	.0778	.0005	.0037
3.2006	.0236	.1462	.0813	.0006	.0037
3.3398	.0253	.1415	.0848	.0006	.0036
3.4789	.0255	.1334	.0884	.0006	.0034
3.6181	.0242	.1217	.0919	.0006	.0031
3.7572	.0214	.1063	.0954	.0005	.0027
3.8964	.0170	.0873	.0990	.0004	.0022
4.0356	.0109	.0644	.1025	.0003	.0016
4.1747	.0031	.0375	.1060	.0001	.0010
4.3069	-.0059	.0083	.1094	-.0002	.0002
4.3139	-.0064	.0068	.1096	-.0002	.0002

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RADIUS (INCHES)    = 15.980      RADIUS (METERS)   = .4059
CHORD  (INCHES)    = 4.314       CHORD  (METERS)   = .1096
ZCSL   (INCHES)    = 2.3057      ZCSL   (METERS)   = .0586
YCSL   (INCHES)    = -.0064      YCSL   (METERS)   = -.0002
RLE    (INCHES)    = -.0071      RLE    (METERS)   = .000180
RTE    (INCHES)    = .0070       RTE    (METERS)   = .000178
X-AREA (SQ. IN.)   = .3865       X-AREA(SQ.METERS) = .000249
GAMMA-CHORD(DEG.)  = 55.70       GAMMA-CHORD(RAD.) = .9722
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TABLE XXIV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 1

Lower section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0069	.0068	.0000	-.0002	.0002
.0071	-.0070	.0071	.0002	-.0002	.0002
.1404	-.0100	.0142	.0036	-.0003	.0004
.2808	-.0126	.0216	.0071	-.0003	.0005
.4212	-.0147	.0291	.0107	-.0004	.0007
.5616	-.0162	.0367	.0143	-.0004	.0009
.7021	-.0172	.0443	.0178	-.0004	.0011
.8425	-.0176	.0519	.0214	-.0004	.0013
.9829	-.0175	.0596	.0250	-.0004	.0015
1.1233	-.0167	.0674	.0285	-.0004	.0017
1.2637	-.0154	.0753	.0321	-.0004	.0019
1.4041	-.0135	.0833	.0357	-.0003	.0021
1.5445	-.0109	.0914	.0392	-.0003	.0023
1.6850	-.0078	.0997	.0428	-.0002	.0025
1.8254	-.0039	.1081	.0464	-.0001	.0027
1.9658	.0005	.1167	.0499	.0000	.0030
2.1062	.0057	.1255	.0535	.0001	.0032
2.2466	.0116	.1345	.0571	.0003	.0034
2.3870	.0182	.1437	.0606	.0005	.0037
2.5274	.0255	.1531	.0642	.0006	.0039
2.6678	.0337	.1639	.0678	.0009	.0042
2.8083	.0431	.1737	.0713	.0011	.0044
2.9487	.0511	.1815	.0749	.0013	.0046
3.0891	.0572	.1855	.0785	.0015	.0047
3.2295	.0609	.1851	.0820	.0015	.0047
3.3699	.0620	.1799	.0856	.0016	.0046
3.5103	.0605	.1701	.0892	.0015	.0043
3.6507	.0564	.1556	.0927	.0014	.0040
3.7911	.0496	.1362	.0963	.0013	.0035
3.9316	.0400	.1118	.0999	.0010	.0028
4.0720	.0275	.0822	.1034	.0007	.0021
4.2124	.0120	.0472	.1070	.0003	.0012
4.3460	-.0055	.0089	.1104	-.0001	.0002
4.3528	-.0064	.0069	.1106	-.0002	.0002

RADIUS (INCHES)	=	16.430	RADIUS (METERS)	=	.4173
CHORD (INCHES)	=	4.353	CHORD (METERS)	=	.1106
ZCSL (INCHES)	=	2.3303	ZCSL (METERS)	=	.0592
YCSL (INCHES)	=	.0134	YCSL (METERS)	=	.0003
RLE (INCHES)	=	.0071	RLE (METERS)	=	.000180
RTE (INCHES)	=	.0070	RTE (METERS)	=	.000178
X-AREA (SQ. IN.)	=	.3939	X-AREA(SQ.METERS)	=	.000254
GAMMA-CHORD(DEG.)	=	56.63	GAMMA-CHORD(RAD.)	=	.9883

Upper section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0071	.0069	.0000	-.0002	.0002
.0073	-.0072	.0073	.0002	-.0002	.0002
.1413	-.0097	.0149	.0036	-.0002	.0004
.2826	-.0111	.0229	.0072	-.0003	.0006
.4240	-.0131	.0311	.0108	-.0003	.0008
.5653	-.0139	.0394	.0144	-.0004	.0010
.7066	-.0141	.0478	.0179	-.0004	.0012
.8479	-.0136	.0564	.0215	-.0003	.0014
.9892	-.0125	.0650	.0251	-.0003	.0017
1.1306	-.0107	.0739	.0287	-.0003	.0019
1.2719	-.0082	.0829	.0323	-.0002	.0021
1.4132	-.0051	.0921	.0359	-.0001	.0023
1.5545	-.0013	.1015	.0395	-.0000	.0026
1.6958	.0032	.1111	.0431	.0001	.0028
1.8372	.0084	.1210	.0467	.0002	.0031
1.9785	.0143	.1310	.0503	.0004	.0033
2.1198	.0210	.1413	.0538	.0005	.0036
2.2611	.0284	.1519	.0574	.0007	.0039
2.4025	.0367	.1629	.0610	.0009	.0041
2.5438	.0458	.1740	.0646	.0012	.0044
2.6851	.0555	.1867	.0682	.0014	.0047
2.8264	.0671	.1988	.0718	.0017	.0050
2.9677	.0770	.2083	.0754	.0020	.0053
3.1091	.0845	.2139	.0790	.0021	.0054
3.2504	.0889	.2143	.0826	.0023	.0054
3.3917	.0899	.2092	.0861	.0023	.0053
3.5330	.0874	.1985	.0897	.0022	.0050
3.6744	.0814	.1821	.0933	.0021	.0046
3.8157	.0718	.1598	.0969	.0018	.0041
3.9570	.0583	.1315	.1005	.0015	.0033
4.0983	.0409	.0967	.1041	.0010	.0025
4.2397	.0193	.0552	.1077	.0005	.0014
4.3742	-.0052	.0073	.1111	-.0001	.0002
4.3809	-.0064	.0070	.1113	-.0002	.0002

RADIUS (INCHES)	=	16.780	RADIUS (METERS)	=	.4262
CHORD (INCHES)	=	4.381	CHORD (METERS)	=	.1113
ZCSL (INCHES)	=	2.3471	ZCSL (METERS)	=	.0596
YCSL (INCHES)	=	.0284	YCSL (METERS)	=	.0007
RLE (INCHES)	=	.0073	RLE (METERS)	=	.000185
RTE (INCHES)	=	.0071	RTE (METERS)	=	.000180
X-AREA (SQ. IN.)	=	.3998	X-AREA(SQ.METERS)	=	.000258
GAMMA-CHORD(DEG.)	=	57.30	GAMMA-CHORD(RAD.)	=	1.0000

TABLE XXV

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0030	.0083	.0000	-.0002	.0002	.0000	-.0067	.0073	.0000	-.0002	.0002
.0078	-.0056	.0125	.0002	-.0001	.0003	.0067	-.0049	.0103	.0002	-.0001	.0003
.0624	-.0141	.0386	.0016	-.0004	.0010	.0629	-.0100	.0353	.0016	-.0003	.0009
.1249	-.0302	.0677	.0032	-.0008	.0017	.1259	-.0275	.0632	.0032	-.0007	.0016
.1873	-.0435	.0961	.0048	-.0013	.0024	.1889	-.0457	.0911	.0048	-.0012	.0023
.2497	-.0688	.1237	.0063	-.0017	.0031	.2518	-.0641	.1183	.0064	-.0016	.0030
.3122	-.0891	.1505	.0079	-.0022	.0038	.3148	-.0825	.1448	.0080	-.0021	.0037
.3746	-.1075	.1767	.0095	-.0027	.0045	.3777	-.1010	.1705	.0096	-.0026	.0043
.4371	-.1269	.2022	.0111	-.0032	.0051	.4407	-.1195	.1954	.0112	-.0030	.0050
.4995	-.1464	.2272	.0127	-.0037	.0058	.5036	-.1381	.2197	.0128	-.0035	.0056
.5619	-.1661	.2519	.0143	-.0042	.0064	.5666	-.1569	.2436	.0144	-.0040	.0062
.6244	-.1857	.2752	.0159	-.0047	.0070	.6295	-.1755	.2664	.0160	-.0045	.0068
.6868	-.2045	.2962	.0174	-.0052	.0075	.6925	-.1936	.2865	.0176	-.0049	.0073
.7492	-.2210	.3146	.0190	-.0056	.0080	.7554	-.2034	.3048	.0192	-.0053	.0077
.8117	-.2351	.3299	.0206	-.0060	.0084	.8184	-.2230	.3196	.0208	-.0057	.0081
.8741	-.2468	.3424	.0222	-.0063	.0087	.8813	-.2340	.3316	.0224	-.0059	.0084
.9366	-.2561	.3518	.0238	-.0065	.0089	.9443	-.2428	.3405	.0240	-.0062	.0086
.9990	-.2629	.3585	.0254	-.0067	.0091	1.0072	-.2491	.3466	.0256	-.0063	.0088
1.0614	-.2672	.3621	.0270	-.0068	.0092	1.0702	-.2529	.3498	.0272	-.0064	.0089
1.1239	-.2690	.3628	.0285	-.0068	.0092	1.1331	-.2544	.3502	.0288	-.0065	.0089
1.1863	-.2682	.3605	.0301	-.0068	.0092	1.1961	-.2534	.3476	.0304	-.0064	.0088
1.2487	-.2649	.3551	.0317	-.0067	.0090	1.2590	-.2498	.3419	.0320	-.0063	.0087
1.3112	-.2580	.3466	.0333	-.0066	.0088	1.3220	-.2436	.3332	.0336	-.0062	.0085
1.3736	-.2495	.3347	.0349	-.0063	.0085	1.3849	-.2347	.3213	.0352	-.0060	.0082
1.4360	-.2375	.3193	.0365	-.0060	.0081	1.4479	-.2229	.3059	.0368	-.0057	.0078
1.4985	-.2222	.3001	.0381	-.0056	.0076	1.5108	-.2081	.2869	.0384	-.0053	.0073
1.5609	-.2034	.2768	.0396	-.0052	.0070	1.5738	-.1900	.2640	.0400	-.0048	.0067
1.6234	-.1809	.2489	.0412	-.0046	.0063	1.6367	-.1685	.2367	.0416	-.0043	.0060
1.6858	-.1542	.2159	.0428	-.0039	.0055	1.6997	-.1431	.2047	.0432	-.0036	.0052
1.7482	-.1228	.1770	.0444	-.0031	.0045	1.7627	-.1134	.1671	.0448	-.0029	.0042
1.8107	-.0861	.1310	.0460	-.0022	.0033	1.8256	-.0720	.1231	.0464	-.0020	.0031
1.8731	-.0431	.0764	.0476	-.0011	.0019	1.8886	-.0390	.0714	.0480	-.0010	.0018
1.9308	-.0039	.0150	.0490	-.0001	.0004	1.9464	-.0033	.0145	.0494	-.0001	.0004
1.9355	-.0078	.0099	.0492	-.0002	.0003	1.9515	-.0076	.0095	.0496	-.0002	.0002

RADIUS (INCHES) =	7.540	RADIUS (METERS) =	.1915	RADIUS (INCHES) =	7.740	RADIUS (METERS) =	.1966

RADIUS (INCHES) = 7.540   RADIUS (METERS) = .1915   RADIUS (INCHES) = 7.740   RADIUS (METERS) = .1966

CHORD (INCHES) = 1.936   CHORD (METERS) = .0492   CHORD (INCHES) = 1.952   CHORD (METERS) = .0496

ZCSL (INCHES) = .9810   ZCSL (METERS) = .0249   ZCSL (INCHES) = .9914   ZCSL (METERS) = .0252

YCSL (INCHES) = .2331   YCSL (METERS) = .0059   YCSL (INCHES) = .2238   YCSL (METERS) = .0057

RLE (INCHES) = .0084   RLE (METERS) = .00214   RLE (INCHES) = .0072   RLE (METERS) = .000133

RTE (INCHES) = .0069   RTE (METERS) = .00174   RTE (INCHES) = .0069   RTE (METERS) = .000176

X-AREA (SQ. IN.) = .1409   X-AREA(SQ.METERS)= .000091   X-AREA (SQ. IN.) = .1433   X-AREA(SQ.METERS)= .000092

GAMMA-CHORD(DEG.)= 33.11   GAMMA-CHORD(RAD.)= .5778   GAMMA-CHORD(DEG.)= 31.67   GAMMA-CHORD(RAD.)= .5528

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TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0063	.0069	.0000	-.0002	.0002	.0000	-.0064	.0070	.0000	-.0002	.0002
.0064	-.0047	.0095	.0002	-.0001	.0002	.0066	-.0049	.0097	.0002	-.0001	.0002
.0635	-.0000	.0332	.0016	-.0000	.0008	.0640	.0081	.0330	.0016	.0002	.0008
.1270	.0249	.0599	.0032	.0006	.0015	.1280	.0229	.0587	.0033	.0006	.0015
.1905	.0409	.0961	.0048	.0010	.0022	.1920	.0378	.0838	.0049	.0010	.0021
.2540	.0571	.1116	.0065	.0015	.0028	.2559	.0526	.1081	.0065	.0013	.0027
.3175	.0733	.1363	.0081	.0019	.0035	.3199	.0675	.1315	.0081	.0017	.0033
.3810	.0897	.1602	.0097	.0023	.0041	.3839	.0823	.1541	.0098	.0021	.0039
.4445	.1062	.1835	.0113	.0027	.0047	.4479	.0971	.1758	.0114	.0025	.0045
.5080	.1228	.2061	.0129	.0031	.0052	.5119	.1119	.1968	.0130	.0028	.0050
.5715	.1397	.2281	.0145	.0035	.0058	.5759	.1270	.2169	.0146	.0032	.0055
.6350	.1505	.2494	.0161	.0040	.0063	.6399	.417	.2362	.0163	.0036	.0060
.6985	.1728	.2685	.0177	.0044	.0068	.7038	.558	.2534	.0179	.0040	.0064
.7620	.1873	.2951	.0194	.0048	.0072	.7678	.633	.2682	.0195	.0043	.0068
.8255	.1997	.2989	.0210	.0051	.0076	.8318	.738	.2803	.0211	.0045	.0071
.8890	.2038	.3099	.0226	.0053	.0079	.8958	.874	.2898	.0228	.0048	.0074
.9525	.2179	.3181	.0242	.0055	.0081	.9598	.941	.2968	.0244	.0049	.0075
1.0160	.2237	.3237	.0258	.0057	.0082	1.0238	.987	.3012	.0260	.0050	.0077
1.0795	.2274	.3266	.0274	.0058	.0083	1.0873	.2045	.3031	.0276	.0051	.0077
1.1430	.2289	.3266	.0290	.0058	.0083	1.1518	.2022	.3025	.0293	.0051	.0077
1.2065	.2280	.3243	.0306	.0058	.0082	1.2157	.2009	.2993	.0309	.0051	.0076
1.2700	.2247	.3188	.0323	.0057	.0081	1.2797	.975	.2935	.0325	.0050	.0075
1.3335	.2190	.3102	.0339	.0056	.0079	1.3437	.921	.2850	.0341	.0049	.0072
1.3970	.2107	.2986	.0355	.0054	.0076	1.4077	.844	.2737	.0358	.0047	.0070
1.4605	.1998	.2838	.0371	.0051	.0072	1.4717	.745	.2595	.0374	.0044	.0066
1.5240	.1861	.2656	.0387	.0047	.0067	1.5357	.621	.2422	.0390	.0041	.0062
1.5875	.1695	.2437	.0403	.0043	.0062	1.5997	.473	.2217	.0406	.0037	.0056
1.6510	.1497	.2179	.0419	.0038	.0055	1.6636	.297	.1976	.0423	.0033	.0050
1.7145	.1266	.1877	.0435	.0032	.0048	1.7276	.093	.1696	.0439	.0028	.0043
1.7780	.0938	.1525	.0452	.0025	.0039	1.7916	.857	.1374	.0455	.0022	.0035
1.8415	.0688	.1118	.0468	.0017	.0028	1.8556	.586	.1003	.0471	.0015	.0025
1.9050	.0332	.0644	.0484	.0006	.0016	1.9196	.277	.0576	.0488	.0007	.0015
1.9630	-.0039	.0137	.0499	-.0001	.0003	1.9773	-.0040	.0130	.0502	-.0001	.0003
1.9685	-.0074	.0090	.0500	-.0002	.0002	1.9836	-.0071	.0085	.0504	-.0002	.0002

RADIUS (INCHES) = 7.985	RADIUS (METERS) = .2028	RADIUS (INCHES) = 9.230	RADIUS (METERS) = .2090
CHORD (INCHES) = 1.968	CHORD (METERS) = .0500	CHORD (INCHES) = 1.984	CHORD (METERS) = .0504
ZCSL (INCHES) = .9980	ZCSL (METERS) = .0254	ZCSL (INCHES) = 1.0015	ZCSL (METERS) = .0254
YCSL (INCHES) = .2061	YCSL (METERS) = .0052	YCSL (INCHES) = .1887	YCSL (METERS) = .0048
RLE (INCHES) = .0068	RLE (METERS) = .00017	RLE (INCHES) = .0069	RLE (METERS) = .000176
RTE (INCHES) = .0070	RTE (METERS) = .000178	RTE (INCHES) = .0071	RTE (METERS) = .000180
X-AREA (SQ. IN.) = .1464	X-AREA(SQ.METERS) = .0000094	X-AREA (SQ. IN.) = .1497	X-AREA(SQ.METERS) = .0000097
GAMMA-CHORD(DEG.) = 23.50	GAMMA-CHORD(RAD.) = .5148	GAMMA-CHORD(DEG.) = 27.47	GAMMA-CHORD(RAD.) = .4794

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

First Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0065	.0070	.0000	-.0002	.0002
.0066	-.0050	.0097	.0002	-.0001	.0002
.0642	-.0080	.0333	.0016	-.0002	.0008
.1285	-.0224	.0588	.0033	-.0006	.0015
.1927	-.0369	.0836	.0049	-.0009	.0021
.2569	-.0512	.1074	.0065	-.0013	.0027
.3212	-.0655	.1303	.0082	-.0017	.0033
.3854	-.0797	.1523	.0098	-.0020	.0039
.4496	-.0938	.1733	.0114	-.0024	.0044
.5138	-.1078	.1936	.0131	-.0027	.0049
.5781	-.1221	.2129	.0147	-.0031	.0054
.6423	-.1360	.2312	.0163	-.0035	.0059
.7066	-.1491	.2476	.0179	-.0038	.0063
.7708	-.1606	.2615	.0196	-.0041	.0066
.8351	-.1703	.2729	.0212	-.0043	.0069
.8993	-.1732	.2817	.0228	-.0045	.0072
.9635	-.1843	.2882	.0245	-.0047	.0073
1.0278	-.1885	.2921	.0261	-.0048	.0074
1.0920	-.1908	.2937	.0277	-.0048	.0075
1.1562	-.1942	.2927	.0294	-.0049	.0074
1.2205	-.1898	.2933	.0310	-.0048	.0073
1.2847	-.1863	.2873	.0326	-.0047	.0072
1.3489	-.1809	.2833	.0343	-.0046	.0072
1.4132	-.1754	.2747	.0359	-.0044	.0070
1.4774	-.1638	.2635	.0375	-.0042	.0067
1.5416	-.1519	.2494	.0392	-.0039	.0063
1.6059	-.1376	.2324	.0408	-.0035	.0059
1.6701	-.1209	.2122	.0424	-.0031	.0054
1.7343	-.1045	.1888	.0441	-.0026	.0048
1.7986	-.0793	.1617	.0457	-.0020	.0041
1.8628	-.0539	.1306	.0473	-.0014	.0033
1.9270	-.0251	.0951	.0489	-.0006	.0024
1.9854	-.0040	.0545	.0504	-.0001	.0014
1.9913	-.0070	.0125	.0506	-.0002	.0003
		.0083			.0002

RADIUS (INCHES)	= 8.350	RADIUS (METERS)	= .2121
CHORD (INCHES)	= 1.991	CHORD (METERS)	= .0506
ZCSL (INCHES)	= 1.0031	ZCSL (METERS)	= .0255
YCSL (INCHES)	= .1816	YCSL (METERS)	= .0046
RLE (INCHES)	= .0070	RLE (METERS)	= .000178
RTE (INCHES)	= .0071	RTE (METERS)	= .000180
X-AREA (SQ. IN.)	= .1546	X-AREA(SQ.METER)	= .000093
GAMMA-CHORD(DEG.)	= 26.54	GAMMA-CHORD(RAD.)	= .4632

Second Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0065	.0071	.0000	-.0002	.0002
.0067	-.0050	.0099	.0002	-.0001	.0003
.0645	-.0084	.0342	.0016	-.0002	.0009
.1291	-.0231	.0603	.0033	-.0006	.0015
.1936	-.0372	.0849	.0049	-.0009	.0022
.2581	-.0510	.1082	.0066	-.0015	.0027
.3227	-.0646	.1304	.0082	-.0016	.0033
.3872	-.0781	.1516	.0098	-.0020	.0039
.4517	-.0914	.1718	.0115	-.0023	.0044
.5162	-.1045	.1912	.0131	-.0027	.0049
.5808	-.1177	.2095	.0148	-.0030	.0053
.6453	-.1305	.2267	.0164	-.0033	.0058
.7098	-.1424	.2420	.0130	-.0036	.0061
.7744	-.1528	.2548	.0197	-.0039	.0065
.8389	-.1615	.2653	.0213	-.0041	.0067
.9034	-.1685	.2734	.0229	-.0043	.0069
.9680	-.1738	.2791	.0246	-.0044	.0071
1.0325	-.1774	.2326	.0262	-.0045	.0072
1.0970	-.1793	.2836	.0279	-.0046	.0072
1.1616	-.1793	.2823	.0295	-.0046	.0071
1.2261	-.1776	.2785	.0311	-.0045	.0071
1.2906	-.1741	.2723	.0328	-.0044	.0069
1.3552	-.1687	.2637	.0344	-.0042	.0067
1.4197	-.1613	.2524	.0361	-.0041	.0064
1.4842	-.1520	.2385	.0377	-.0039	.0061
1.5488	-.1406	.2217	.0393	-.0036	.0056
1.6133	-.1271	.2021	.0410	-.0032	.0051
1.6778	-.1113	.1793	.0426	-.0028	.0046
1.7424	-.0951	.1531	.0443	-.0024	.0039
1.8069	-.0724	.1233	.0459	-.0018	.0031
1.8714	-.0489	.0895	.0475	-.0012	.0023
1.9359	-.0224	.0512	.0492	-.0006	.0013
1.9944	-.0041	.0121	.0507	-.0001	.0003
2.0005	-.0069	.0080	.0508	-.0002	.0002

RADIUS (INCHES)	= 8.350	RADIUS (METERS)	= .2159
CHORD (INCHES)	= 2.000	CHORD (METERS)	= .0508
ZCSL (INCHES)	= 1.0054	ZCSL (METERS)	= .0255
YCSL (INCHES)	= .1743	YCSL (METERS)	= .0044
RLE (INCHES)	= .0071	RLE (METERS)	= .000179
RTE (INCHES)	= .0070	RTE (METERS)	= .000179
X-AREA (SQ. IN.)	= .1559	X-AREA(SQ.METER)	= .0000099
GAMMA-CHORD(DEG.)	= 25.55	GAMMA-CHORD(RAD.)	= .4459

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0003	-.0064	.0070	.0000	-.0002	.0002
.0067	-.0050	.0098	.0002	-.0002	.0002
.0659	.0073	.0341	.0017	.0002	.0009
.1319	.0207	.0600	.0034	.0005	.0015
.1979	.0336	.0842	.0050	.0008	.0021
.2638	.0459	.1065	.0067	.0012	.0027
.3298	.0577	.1280	.0084	.0015	.0033
.3957	.0689	.1477	.0101	.0017	.0038
.4617	.0796	.1659	.0117	.0020	.0042
.5276	.0897	.1826	.0134	.0023	.0046
.5936	.0995	.1980	.0151	.0025	.0050
.6595	.1086	.2119	.0168	.0028	.0054
.7255	.1167	.2238	.0184	.0030	.0057
.7914	.1236	.2337	.0201	.0031	.0059
.8574	.1302	.2414	.0218	.0033	.0061
.9233	.1363	.2471	.0235	.0034	.0063
.9893	.1363	.2506	.0251	.0035	.0064
1.0552	.1379	.2521	.0268	.0035	.0064
1.1212	.1381	.2515	.0285	.0035	.0064
1.1871	.1370	.2489	.0302	.0035	.0063
1.2531	.1345	.2441	.0318	.0034	.0062
1.3191	.1307	.2372	.0335	.0033	.0060
1.3850	.1255	.2282	.0352	.0032	.0058
1.4510	.1189	.2170	.0369	.0030	.0055
1.5169	.1109	.2035	.0385	.0028	.0052
1.5829	.1015	.1878	.0402	.0026	.0048
1.6488	.0906	.1698	.0419	.0023	.0043
1.7148	.0783	.1494	.0436	.0020	.0039
1.7807	.0644	.1264	.0452	.0016	.0032
1.8467	.0490	.1008	.0469	.0012	.0026
1.9126	.0321	.0725	.0486	.0008	.0018
1.9786	.0135	.0413	.0503	.0003	.0010
2.0381	-.0046	.0107	.0518	-.0001	.0003
2.0445	-.0065	.0070	.0519	-.0002	.0002

	English Units			SI Units	
RADIUS	(INCHES) = 9.500		RADIUS	(METERS) = .2413	
CHORD	(INCHES) = 2.045		CHORD	(METERS) = .0519	
ZCSL	(INCHES) = 1.0238		ZCSL	(METERS) = .0260	
YCSL	(INCHES) = .1494		YCSL	(METERS) = .0038	
RLE	(INCHES) = .0071		RLE	(METERS) = .000180	
RTE	(INCHES) = .0070		RTE	(METERS) = .000178	
X-AREA (SG. IN.) = .1602			X-AREA(SG.METERS)= .000105		
GAMMA-CHORD(DEG.)= 21.74			GAMMA-CHORD(RAD.)= .3794		

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0064	.0070	.0000	-.0002	.0002
.0067	-.0050	.0097	.0002	-.0001	.0002
.0665	.0073	.0347	.0017	.0002	.0009
.1330	.0204	.0607	.0034	.0005	.0015
.1994	.0328	.0850	.0051	.0008	.0022
.2659	.0446	.1076	.0068	.0011	.0027
.3324	.0557	.1285	.0084	.0014	.0033
.3989	.0662	.1477	.0101	.0017	.0038
.4654	.0760	.1652	.0118	.0019	.0042
.5319	.0851	.1812	.0135	.0022	.0046
.5983	.0937	.1957	.0152	.0024	.0050
.6648	.1016	.2086	.0169	.0026	.0053
.7313	.1086	.2196	.0186	.0028	.0056
.7978	.1145	.2286	.0203	.0029	.0058
.8643	.1191	.2356	.0220	.0030	.0060
.9308	.1226	.2406	.0236	.0031	.0061
.9972	.1249	.2436	.0253	.0032	.0062
1.0637	.1260	.2447	.0270	.0032	.0062
1.1302	.1259	.2437	.0287	.0032	.0062
1.1967	.1246	.2408	.0304	.0032	.0061
1.2632	.1221	.2358	.0321	.0031	.0060
1.3297	.1184	.2289	.0338	.0030	.0058
1.3961	.1134	.2199	.0355	.0029	.0056
1.4626	.1072	.2088	.0372	.0027	.0053
1.5291	.0998	.1956	.0388	.0025	.0050
1.5956	.0911	.1803	.0405	.0023	.0046
1.6621	.0811	.1627	.0422	.0021	.0041
1.7285	.0699	.1430	.0439	.0018	.0036
1.7950	.0573	.1208	.0456	.0015	.0031
1.8615	.0434	.0963	.0473	.0011	.0024
1.9280	.0281	.0692	.0490	.0007	.0018
1.9945	.0114	.0395	.0507	.0003	.0010
2.0544	-.0047	.0104	.0522	-.0001	.0003
2.0610	-.0064	.0072	.0523	-.0002	.0002

	English Units			SI Units	
RADIUS	(INCHES) = 10.000		RADIUS	(METERS) = .2540	
CHORD	(INCHES) = 2.061		CHORD	(METERS) = .0523	
ZCSL	(INCHES) = 1.0312		ZCSL	(METERS) = .0262	
YCSL	(INCHES) = .1428		YCSL	(METERS) = .0036	
RLE	(INCHES) = .0070		RLE	(METERS) = .000178	
RTE	(INCHES) = .0070		RTE	(METERS) = .000178	
X-AREA (SQ. IN.) = .1753			X-AREA(SG.METERS)= .000113		
GAMMA-CHORD(DEG.)= 20.47			GAMMA-CHORD(RAD.)= .3573		

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — STATOR 1

First Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0065	.0071	.0000	-.0002	.0002
.0067	-.0050	.0098	.0002	-.0001	.0003
.0649	-.0080	.0339	.0016	-.0002	.0009
.1298	-.0223	.0598	.0033	-.0006	.0015
.1947	-.0363	.0845	.0049	-.0009	.0021
.2596	-.0501	.1079	.0066	.0013	.0027
.3245	-.0635	.1301	.0082	.0016	.0033
.3894	-.0766	.1512	.0099	.0019	.0038
.4543	-.0834	.1710	.0115	.0023	.0043
.5192	-.1020	.1898	.0132	.0026	.0049
.5841	-.1144	.2075	.0148	.0029	.0053
.6489	-.1263	.2238	.0165	.0034	.0057
.7138	-.1371	.2381	.0181	.0035	.0060
.7787	-.1465	.2500	.0198	.0037	.0064
.8436	-.1542	.2597	.0214	.0039	.0066
.9085	-.1603	.2670	.0231	.0041	.0068
.9734	-.1647	.2719	.0247	.0042	.0069
1.0383	-.1675	.2746	.0264	.0043	.0070
1.1032	-.1687	.2750	.0280	.0043	.0070
1.1681	-.1682	.2730	.0297	.0043	.0069
1.2330	-.1660	.2688	.0313	.0042	.0068
1.2979	-.1620	.2621	.0330	.0041	.0067
1.3628	-.1565	.2531	.0346	.0040	.0064
1.4277	-.1492	.2417	.0363	.0036	.0061
1.4926	-.1401	.2277	.0379	.0036	.0058
1.5575	-.1291	.2112	.0396	.0033	.0054
1.6224	-.1163	.1919	.0412	.0030	.0049
1.6873	-.1014	.1698	.0429	.0026	.0043
1.7522	-.0844	.1445	.0445	.0021	.0037
1.8171	-.0652	.1160	.0462	.0017	.0029
1.8820	-.0437	.0835	.0478	.0011	.0021
1.9468	-.0136	.0479	.0494	-.0005	.0012
2.0056	-.0042	.0116	.0509	-.0001	.0003
2.0117	-.0067	.0078	.0511	-.0002	.0002

RADIUS	(INCHES)	=	8.700	RADIUS	(METERS)	=	.2210
CHORD	(INCHES)	=	2.012	CHORD	(METERS)	=	.0511
ZCSL	(INCHES)	=	1.0101	ZCSL	(METERS)	=	.0257
YCSL	(INCHES)	=	.1678	YCSL	(METERS)	=	.0043
RLE	(INCHES)	=	.0071	RLE	(METERS)	=	.000173
RTE	(INCHES)	=	.0070	RTE	(METERS)	=	.000178
X-AREA	(SQ. IN.)	=	.1568	X-AREA	(SQ.METER.)	=	.000101
GAMMA-CHORD	(DEG.)	=	24.57	GAMMA-CHORD	(RAD.)	=	.4287

Second Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0065	.0070	.0000	-.0002	.0002
.0067	-.0050	.0097	.0002	-.0001	.0002
.0653	-.0076	.0338	.0017	-.0002	.0009
.1307	-.0213	.0595	.0033	.0005	.0015
.1961	-.0347	.0838	.0050	.0009	.0021
.2614	-.0476	.1067	.0066	.0012	.0027
.3268	-.0602	.1283	.0083	.0015	.0033
.3921	-.0725	.1486	.0100	.0018	.0038
.4575	-.0843	.1676	.0116	.0021	.0043
.5228	-.0958	.1855	.0133	.0024	.0047
.5882	-.1070	.2021	.0149	.0027	.0051
.6535	-.1177	.2174	.0166	.0030	.0055
.7189	-.1274	.2307	.0183	.0032	.0059
.7842	-.1357	.2407	.0199	.0034	.0061
.8496	-.1425	.2505	.0216	.0036	.0064
.9143	-.1478	.2571	.0232	.0038	.0065
.9803	-.1516	.2615	.0249	.0039	.0066
1.0456	-.1539	.2637	.0266	.0039	.0067
1.1110	-.1547	.2637	.0282	.0039	.0067
1.1763	-.1540	.2615	.0299	.0039	.0066
1.2417	-.1518	.2571	.0315	.0039	.0065
1.3070	-.1479	.2504	.0332	.0038	.0064
1.3724	-.1426	.2414	.0349	.0036	.0061
1.4377	-.1355	.2301	.0365	.0034	.0058
1.5031	-.1269	.2164	.0382	.0032	.0055
1.5685	-.1166	.2002	.0398	.0030	.0051
1.6338	-.1045	.1915	.0415	.0027	.0046
1.6992	-.0908	.1600	.0432	.0023	.0041
1.7645	-.0751	.1358	.0448	.0019	.0034
1.8299	-.0576	.1086	.0465	.0015	.0028
1.8952	-.0382	.0783	.0481	.0010	.0020
1.9606	-.0167	.0446	.0498	.0004	.0011
2.0196	-.0044	.0111	.0513	-.0001	.0003
2.0259	-.0066	.0075	.0515	-.0002	.0002

RADIUS	(INCHES)	=	9.000	RADIUS	(METERS)	=	.2286
CHORD	(INCHES)	=	2.026	CHORD	(METERS)	=	.0515
ZCSL	(INCHES)	=	1.0158	ZCSL	(METERS)	=	.0258
YCSL	(INCHES)	=	.1590	YCSL	(METERS)	=	.0040
RLE	(INCHES)	=	.0070	RLE	(METERS)	=	.000178
RTE	(INCHES)	=	.0070	RTE	(METERS)	=	.000178
X-AREA	(SQ. IN.)	=	.1611	X-AREA	(SG.METERS)	=	.000104
GAMMA-CHORD	(DEG.)	=	23.31	GAMMA-CHORD	(RAD.)	=	.4068

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0064	.0071	.0000	-.0002	.0002	.0000	-.0062	.0069	.0000	-.0002	.0002
.0068	-.0050	.0099	.0002	-.0001	.0003	.0066	-.0049	.0098	.0002	-.0001	.0002
.0674	-.0070	.0355	.0017	-.0002	.0009	.0682	-.0067	.0363	.0017	-.0002	.0009
.1348	-.0197	.0624	.0034	-.0005	.0016	.1364	-.0189	.0636	.0035	-.0005	.0016
.2022	-.0316	.0871	.0051	-.0008	.0022	.2046	-.0302	.0887	.0052	-.0008	.0023
.2696	-.0427	.1099	.0068	-.0011	.0028	.2729	-.0406	.1117	.0069	-.0010	.0028
.3370	-.0530	.1307	.0086	-.0013	.0033	.3411	-.0503	.1326	.0087	-.0013	.0034
.4044	-.0625	.1496	.0103	-.0016	.0038	.4093	-.0590	.1515	.0104	-.0015	.0038
.4717	-.0712	.1667	.0120	-.0018	.0042	.4775	-.0670	.1685	.0121	-.0017	.0043
.5391	-.0791	.1819	.0137	-.0020	.0046	.5457	-.0740	.1835	.0139	-.0019	.0047
.6065	-.0862	.1954	.0154	-.0022	.0050	.6133	-.0803	.1966	.0156	-.0020	.0050
.6739	-.0926	.2071	.0171	-.0024	.0053	.6821	-.0857	.2079	.0173	-.0022	.0053
.7413	-.0981	.2170	.0188	-.0025	.0055	.7504	-.0903	.2173	.0191	-.0023	.0055
.8087	-.1025	.2250	.0205	-.0026	.0057	.8186	-.0941	.2248	.0208	-.0024	.0057
.8761	-.1058	.2310	.0223	-.0027	.0059	.8868	-.0969	.2305	.0225	-.0025	.0059
.9435	-.1085	.2352	.0240	-.0028	.0060	.9550	-.0988	.2343	.0243	-.0025	.0060
1.0109	-.1100	.2375	.0257	-.0028	.0060	1.0232	-.0999	.2363	.0260	-.0025	.0060
1.0783	-.1105	.2379	.0274	-.0028	.0060	1.0914	-.1000	.2364	.0277	-.0025	.0060
1.1457	-.1099	.2365	.0291	-.0028	.0060	1.1596	-.0993	.2347	.0295	-.0025	.0060
1.2131	-.1084	.2331	.0308	-.0027	.0059	1.2279	-.0977	.2311	.0312	-.0025	.0059
1.2805	-.1058	.2279	.0325	-.0026	.0058	1.2961	-.0951	.2257	.0329	-.0024	.0057
1.3478	-.1022	.2208	.0342	-.0026	.0056	1.3643	-.0917	.2184	.0347	-.0023	.0055
1.4152	-.0976	.2117	.0359	-.0025	.0054	1.4325	-.0874	.2093	.0364	-.0022	.0053
1.4826	-.0920	.2007	.0377	-.0023	.0051	1.5007	-.0822	.1982	.0381	-.0021	.0050
1.5500	-.0853	.1877	.0394	-.0022	.0048	1.5689	-.0760	.1852	.0399	-.0019	.0047
1.6174	-.0776	.1727	.0411	-.0020	.0044	1.6371	-.0690	.1703	.0416	-.0018	.0043
1.6848	-.0688	.1556	.0428	-.0017	.0040	1.7054	-.0610	.1533	.0433	-.0015	.0039
1.7522	-.0590	.1365	.0445	-.0015	.0035	1.7736	-.0521	.1343	.0450	-.0013	.0034
1.8196	-.0481	.1152	.0462	-.0012	.0029	1.8418	-.0423	.1132	.0468	-.0011	.0029
1.8870	-.0361	.0916	.0479	-.0009	.0023	1.9100	-.0315	.0900	.0485	-.0008	.0023
1.9544	-.0230	.0658	.0496	-.0006	.0017	1.9782	-.0199	.0646	.0502	-.0005	.0016
2.0218	-.0089	.0376	.0514	-.0002	.0010	2.0464	-.0072	.0368	.0520	-.0002	.0009
2.0826	-.0048	.0100	.0529	-.0001	.0003	2.1146	-.0063	.0070	.0537	-.0002	.0002
2.0892	-.0063	.0070	.0531	-.0002	.0002						

English Units (Inches) — left section:

```
RADIUS  (INCHES)  = 11.000
CHORD   (INCHES)  =  2.089
ZCSL    (INCHES)  =  1.0443
YCSL    (INCHES)  =   .1355
RLE     (INCHES)  =   .0071
RTE     (INCHES)  =   .0070
X-AREA  (SQ. IN.) =   .1898
GAMMA-CHORD(DEG.) =  18.84
```

SI Units (Meters) — left section:

```
RADIUS  (METERS)   =  .2794
CHORD   (METERS)   =  .0531
ZCSL    (METERS)   =  .0265
YCSL    (METERS)   =  .0034
RLE     (METERS)   =  .000181
RTE     (METERS)   =  .000178
X-AREA(SQ.METERS)= .000122
GAMMA-CHORD(RAD.)= .3288
```

English Units (Inches) — right section:

```
RADIUS  (INCHES)  = 12.000
CHORD   (INCHES)  =  2.115
ZCSL    (INCHES)  =  1.0569
YCSL    (INCHES)  =   .1316
RLE     (INCHES)  =   .0070
RTE     (INCHES)  =   .0070
X-AREA  (SQ. IN.) =   .2045
GAMMA-CHORD(DEG.) =  18.02
```

SI Units (Meters) — right section:

```
RADIUS  (METERS)   =  .3048
CHORD   (METERS)   =  .0537
ZCSL    (METERS)   =  .0268
YCSL    (METERS)   =  .0033
RLE     (METERS)   =  .000177
RTE     (METERS)   =  .000178
X-AREA(SQ.METERS)= .000132
GAMMA-CHORD(RAD.)= .3146
```

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)

ZC	YP	YS
.0000	-.0063	.0070
.0068	-.0050	.0099
.0690	.0061	.0368
.1380	.0177	.0647
.2070	.0285	.0902
.2760	.0384	.1135
.3450	.0474	.1347
.4140	.0556	.1537
.4829	.0630	.1708
.5519	.0695	.1858
.6209	.0751	.1988
.6899	.0800	.2099
.7589	.0839	.2190
.8279	.0871	.2263
.8969	.0895	.2318
.9659	.0910	.2354
1.0349	.0918	.2372
1.1039	.0917	.2371
1.1729	.0909	.2352
1.2419	.0893	.2315
1.3109	.0868	.2259
1.3799	.0835	.2185
1.4489	.0795	.2092
1.5178	.0746	.1981
1.5868	.0689	.1850
1.6558	.0624	.1700
1.7248	.0551	.1530
1.7938	.0469	.1340
1.8628	.0379	.1129
1.9318	.0281	.0897
2.0008	.0175	.0643
2.0698	.0060	.0366
2.1321	-.0050	.0098
2.1388	-.0062	.0069

RADIUS (INCHES) = 13.000
CHORD (INCHES) = 2.139
ZCSL (INCHES) = 1.0690
YCSL (INCHES) = .1292
RLE (INCHES) = .0071
RTE (INCHES) = .0070
X-AREA (SQ. IN.) = .2196
GAMMA-CHORD(DEG.)= 17.67

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0001	.0003
.0018	.0002	.0009
.0035	.0005	.0016
.0053	.0007	.0023
.0070	.0010	.0029
.0088	.0012	.0034
.0105	.0014	.0039
.0123	.0016	.0043
.0140	.0018	.0047
.0158	.0019	.0050
.0175	.0020	.0053
.0193	.0021	.0056
.0210	.0022	.0057
.0228	.0023	.0059
.0245	.0023	.0060
.0263	.0023	.0060
.0280	.0023	.0060
.0298	.0023	.0060
.0315	.0023	.0059
.0333	.0022	.0057
.0350	.0021	.0056
.0368	.0020	.0053
.0386	.0019	.0050
.0403	.0018	.0047
.0421	.0016	.0043
.0438	.0014	.0039
.0456	.0012	.0034
.0473	.0010	.0029
.0491	.0007	.0023
.0508	.0004	.0016
.0526	.0001	.0009
.0542	-.0001	.0002
.0543	-.0002	.0002

RADIUS (METERS) = .3302
CHORD (METERS) = .0543
ZCSL (METERS) = .0272
YCSL (METERS) = .0033
RLE (METERS) = .000181
RTE (METERS) = .000179
X-AREA(SQ.METER.)= .000142
GAMMA-CHORD(RAD.)= .3084

English Units (Inches)

ZC	YP	YS
.0000	-.0062	.0070
.0068	-.0051	.0100
.0697	.0057	.0375
.1395	.0169	.0660
.2093	.0272	.0921
.2790	.0367	.1160
.3488	.0453	.1376
.4185	.0551	.1570
.4883	.0601	.1742
.5580	.0662	.1894
.6273	.0714	.2026
.6975	.0758	.2137
.7673	.0794	.2228
.8371	.0842	.2301
.9068	.0843	.2354
.9766	.0856	.2390
1.0463	.0862	.2406
1.1161	.0860	.2404
1.1858	.0851	.2384
1.2556	.0834	.2346
1.3253	.0810	.2289
1.3951	.0779	.2213
1.4648	.0740	.2118
1.5346	.0694	.2005
1.6044	.0640	.1872
1.6741	.0579	.1719
1.7439	.0510	.1547
1.8136	.0434	.1354
1.8834	.0350	.1141
1.9531	.0259	.0906
2.0229	.0159	.0649
2.0926	.0052	.0369
2.1557	-.0050	.0097
2.1624	-.0061	.0068

RADIUS (INCHES) = 14.000
CHORD (INCHES) = 2.162
ZCSL (INCHES) = 1.0808
YCSL (INCHES) = .1286
RLE (INCHES) = .0071
RTE (INCHES) = .0070
X-AREA (SQ. IN.) = .2352
GAMMA-CHORD(DEG.)= 17.50

SI Units (Meters)

ZC	YP	YS
.0000	-.0002	.0002
.0002	-.0001	.0003
.0018	.0001	.0010
.0035	.0004	.0017
.0053	.0007	.0023
.0071	.0009	.0029
.0089	.0012	.0035
.0106	.0013	.0040
.0124	.0015	.0044
.0142	.0017	.0048
.0159	.0018	.0051
.0177	.0019	.0054
.0195	.0020	.0057
.0213	.0021	.0058
.0230	.0021	.0060
.0248	.0022	.0061
.0266	.0022	.0061
.0283	.0022	.0061
.0301	.0022	.0061
.0319	.0021	.0060
.0337	.0021	.0058
.0354	.0020	.0056
.0372	.0019	.0054
.0390	.0018	.0051
.0408	.0016	.0048
.0425	.0015	.0044
.0443	.0013	.0039
.0461	.0011	.0034
.0478	.0009	.0029
.0496	.0007	.0023
.0514	.0004	.0016
.0532	.0001	.0009
.0548	-.0001	.0002
.0549	-.0002	.0002

RADIUS (METERS) = .3556
CHORD (METERS) = .0549
ZCSL (METERS) = .0275
YCSL (METERS) = .0033
RLE (METERS) = .000181
RTE (METERS) = .000178
X-AREA(SG.METER.)= .000152
GAMMA-CHORD(RAD.)= .3055

TABLE XXV (Cont'd)

AIRFOIL CORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0061	.0069	.0000	-.0002	.0002	.0000	-.0061	.0070	.0000	-.0002	.0002
.0067	-.0049	.0100	.0002	-.0001	.0003	.0067	-.0048	.0103	.0002	-.0001	.0003
.0705	-.0064	.0395	.0018	-.0002	.0010	.0709	-.0076	.0416	.0018	-.0002	.0011
.1410	-.0130	.0697	.0036	-.0003	.0018	.1418	-.0205	.0737	.0036	-.0005	.0019
.2115	-.0288	.0972	.0054	-.0007	.0025	.2126	-.0323	.1029	.0054	-.0008	.0026
.2820	-.0335	.1223	.0072	-.0010	.0031	.2835	-.0431	.1294	.0072	-.0011	.0033
.3525	-.0473	.1448	.0090	-.0012	.0037	.3544	-.0527	.1532	.0090	-.0013	.0039
.4230	-.0552	.1650	.0107	-.0014	.0042	.4253	-.0612	.1744	.0108	-.0016	.0044
.4935	-.0621	.1825	.0125	-.0016	.0046	.4962	-.0687	.1932	.0126	-.0017	.0049
.5640	-.0681	.1985	.0143	-.0017	.0050	.5670	-.0752	.2095	.0144	-.0019	.0053
.6345	-.0731	.2119	.0161	-.0019	.0054	.6379	-.0806	.2235	.0162	-.0020	.0057
.7050	-.0772	.2232	.0179	-.0020	.0057	.7088	-.0849	.2351	.0180	-.0022	.0060
.7755	-.0804	.2322	.0197	-.0020	.0059	.7797	-.0882	.2444	.0198	-.0022	.0062
.8460	-.0826	.2392	.0215	-.0021	.0061	.8506	-.0904	.2515	.0216	-.0023	.0064
.9166	-.0841	.2442	.0233	-.0021	.0062	.9214	-.0917	.2564	.0234	-.0023	.0065
.9871	-.0849	.2474	.0251	-.0022	.0063	.9923	-.0922	.2593	.0252	-.0023	.0066
1.0576	-.0850	.2487	.0269	-.0022	.0063	1.0632	-.0920	.2604	.0270	-.0023	.0066
1.1281	-.0845	.2482	.0287	-.0021	.0063	1.1341	-.0911	.2595	.0288	-.0023	.0066
1.1986	-.0832	.2458	.0304	-.0021	.0062	1.2050	-.0895	.2567	.0306	-.0023	.0065
1.2691	-.0813	.2415	.0322	-.0021	.0061	1.2758	-.0872	.2520	.0324	-.0022	.0064
1.3396	-.0787	.2354	.0340	-.0020	.0060	1.3467	-.0842	.2454	.0342	-.0021	.0062
1.4101	-.0754	.2274	.0358	-.0019	.0058	1.4176	-.0805	.2369	.0360	-.0020	.0060
1.4806	-.0745	.2174	.0376	-.0019	.0055	1.4885	-.0761	.2264	.0378	-.0019	.0058
1.5511	-.0668	.2056	.0394	-.0017	.0052	1.5594	-.0710	.2139	.0396	-.0018	.0054
1.6216	-.0615	.1918	.0412	-.0016	.0049	1.6302	-.0653	.1995	.0414	-.0017	.0051
1.6921	-.0554	.1761	.0430	-.0014	.0045	1.7011	-.0588	.1830	.0432	-.0015	.0046
1.7626	-.0487	.1583	.0448	-.0012	.0040	1.7720	-.0516	.1644	.0450	-.0013	.0042
1.8331	-.0413	.1385	.0466	-.0010	.0035	1.8429	-.0438	.1438	.0468	-.0011	.0037
1.9036	-.0332	.1166	.0484	-.0008	.0030	1.9138	-.0352	.1209	.0486	-.0009	.0031
1.9741	-.0244	.0925	.0501	-.0006	.0023	1.9846	-.0259	.0958	.0504	-.0007	.0024
2.0446	-.0149	.0662	.0519	-.0004	.0017	2.0555	-.0159	.0685	.0522	-.0004	.0017
2.1151	-.0048	.0376	.0537	-.0001	.0010	2.1264	-.0053	.0388	.0540	-.0001	.0010
2.1789	-.0050	.0097	.0553	-.0001	.0002	2.1906	-.0050	.0098	.0556	-.0001	.0002
2.1856	-.0061	.0068	.0555	-.0002	.0002	2.1973	-.0060	.0068	.0558	-.0002	.0002

RADIUS   (INCHES) = 15.000
CHORD   (INCHES) = 2.186
ZCSL   (INCHES) = 1.0922
YCSL   (INCHES) = .1318
RLE   (INCHES) = .0071
RTE   (INCHES) = .0070
X-AREA (SQ. IN.) = .2514
GAMMA-CHORD(DEG.)= 17.40

RADIUS   (METERS) = .3910
CHORD   (METERS) = .0555
ZCSL   (METERS) = .0277
YCSL   (METERS) = .0033
RLE   (METERS) = .00018
RTE   (METERS) = .00017
X-AREA(SQ.METERS)= .000162
GAMMA-CHORD(RAD.)= .3037

RADIUS   (INCHES) = 15.500
CHORD   (INCHES) = 2.197
ZCSL   (INCHES) = 1.0978
YCSL   (INCHES) = .1392
RLE   (INCHES) = .0071
RTE   (INCHES) = .0070
X-AREA (SQ. IN.) = .2601
GAMMA-CHORD(DEG.)= 18.10

RADIUS   (METERS) = .3937
CHORD   (METERS) = .0558
ZCSL   (METERS) = .0279
YCSL   (METERS) = .0035
RLE   (METERS) = .00018
RTE   (METERS) = .00018
X-AREA(SQ.METERS)= .000168
GAMMA-CHORD(RAD.)= .3159

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

Section A

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0062	.0073	.0000	-.0002	.0002
.0066	-.0046	.0109	.0002	-.0001	.0003
.0713	.0108	.0461	.0018	.0003	.0012
.1425	.0267	.0821	.0036	.0007	.0021
.2138	.0413	.1149	.0054	.0010	.0029
.2851	.0546	.1443	.0072	.0014	.0037
.3563	.0666	.1709	.0091	.0017	.0043
.4276	.0772	.1945	.0109	.0020	.0049
.4989	.0867	.2153	.0127	.0022	.0055
.5701	.0948	.2335	.0145	.0024	.0059
.6414	.1017	.2491	.0163	.0026	.0063
.7127	.1073	.2621	.0181	.0027	.0067
.7839	.1118	.2726	.0199	.0028	.0069
.8552	.1149	.2806	.0217	.0029	.0071
.9265	.1169	.2862	.0235	.0030	.0073
.9977	.1176	.2895	.0253	.0030	.0074
1.0690	.1175	.2906	.0272	.0030	.0074
1.1403	.1164	.2896	.0290	.0030	.0074
1.2115	.1145	.2865	.0308	.0029	.0073
1.2828	.1117	.2813	.0326	.0028	.0071
1.3541	.1080	.2740	.0344	.0027	.0070
1.4254	.1034	.2645	.0362	.0026	.0067
1.4966	.0979	.2528	.0380	.0025	.0064
1.5679	.0915	.2390	.0398	.0023	.0061
1.6392	.0843	.2229	.0416	.0021	.0057
1.7104	.0761	.2046	.0434	.0019	.0052
1.7817	.0671	.1839	.0453	.0017	.0047
1.8530	.0571	.1609	.0471	.0015	.0041
1.9242	.0463	.1353	.0489	.0012	.0034
1.9955	.0345	.1072	.0507	.0009	.0027
2.0668	.0219	.0765	.0525	.0006	.0019
2.1380	.0083	.0431	.0543	.0002	.0011
2.2027	-.0047	.0103	.0559	-.0001	.0003
2.2093	-.0061	.0070	.0561	-.0002	.0002

	English Units		SI Units	
RADIUS	(INCHES) =	16.000	(METERS) =	.4064
CHORD	(INCHES) =	2.2209	(METERS) =	.0561
ZCSL	(INCHES) =	1.1037	(METERS) =	.0280
YCSL	(INCHES) =	.1610	(METERS) =	.0041
RLE	(INCHES) =	.0071	(METERS) =	.000180
RTE	(INCHES) =	.0070	(METERS) =	.000178
X-AREA	(SQ. IN.) =	.2699	(SQ.METERS) =	.000174
GAMMA-CHORD	(DEG.) =	13.10	(RAD.) =	.3158

Section B

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0062	.0074	.0000	-.0002	.0002
.0066	-.0045	.0112	.0002	-.0001	.0003
.0714	.0125	.0485	.0018	.0003	.0012
.1428	.0351	.0966	.0036	.0009	.0022
.2143	.0462	.1211	.0054	.0012	.0031
.2857	.0609	.1523	.0073	.0015	.0039
.3571	.0742	.1803	.0091	.0019	.0046
.4285	.0861	.2052	.0109	.0022	.0052
.4999	.0966	.2273	.0127	.0025	.0058
.5714	.1058	.2465	.0145	.0027	.0063
.6428	.1137	.2631	.0163	.0029	.0067
.7142	.1202	.2769	.0181	.0031	.0070
.7856	.1253	.2882	.0200	.0032	.0073
.8570	.1292	.2969	.0218	.0033	.0075
.9284	.1317	.3030	.0236	.0033	.0077
.9999	.1330	.3068	.0254	.0034	.0078
1.0713	.1331	.3081	.0272	.0034	.0078
1.1427	.1322	.3072	.0290	.0034	.0078
1.2141	.1302	.3041	.0308	.0033	.0077
1.2855	.1272	.2988	.0327	.0032	.0076
1.3570	.1232	.2912	.0345	.0031	.0074
1.4284	.1182	.2813	.0363	.0030	.0071
1.4998	.1121	.2691	.0381	.0028	.0068
1.5712	.1050	.2545	.0399	.0027	.0065
1.6426	.0969	.2376	.0417	.0025	.0060
1.7141	.0877	.2182	.0435	.0022	.0055
1.7855	.0775	.1963	.0454	.0020	.0050
1.8569	.0662	.1718	.0472	.0017	.0044
1.9283	.0539	.1446	.0490	.0014	.0037
1.9997	.0405	.1146	.0508	.0010	.0029
2.0712	.0260	.0818	.0526	.0007	.0021
2.1426	.0104	.0459	.0544	.0003	.0012
2.2075	-.0046	.0106	.0561	-.0001	.0003
2.2140	-.0061	.0071	.0562	-.0002	.0002

	English Units		SI Units	
RADIUS	(INCHES) =	16.200	(METERS) =	.4115
CHORD	(INCHES) =	2.214	(METERS) =	.0562
ZCSL	(INCHES) =	1.1062	(METERS) =	.0281
YCSL	(INCHES) =	.1739	(METERS) =	.0044
RLE	(INCHES) =	.0072	(METERS) =	.000183
RTE	(INCHES) =	.0070	(METERS) =	.000178
X-AREA	(SQ. IN.) =	.2743	(SQ.METERS) =	.000177
GAMMA-CHORD	(DEG.) =	18.17	(RAD.) =	.3172

TABLE XXV (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 1

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0063	.0076	.0000	-.0002	.0002	.0000	-.065	.0079	.0000	-.0002	-.0002
.0065	-.0044	.0116	.0002	-.0001	-.0003	.0066	-.0044	.0121	.0002	-.0001	-.0003
.0716	-.146	.0515	.0018	-.0004	.0013	.0717	.162	.0539	.0018	.0004	.0014
.1432	-.343	.0923	.0036	-.0005	.0023	.1435	.375	.0968	.0036	.0010	.0025
.2148	-.524	.1292	.0055	-.0013	.0033	.2153	.571	.1354	.0055	.0015	.0034
.2864	-.690	.1626	.0073	-.0018	.0041	.2870	.752	.1705	.0073	.0019	.0043
.3580	-.841	.1926	.0091	-.0021	.0049	.3588	.916	.2019	.0091	.0023	.0051
.4297	-.977	.2193	.0109	-.0025	.0056	.4305	.065	.2301	.0109	.0027	.0058
.5013	-1.038	.2430	.0127	-.0028	.0062	.5023	1.198	.2551	.0128	.0030	.0065
.5729	-.204	.2638	.0146	-.0031	.0067	.5740	.316	.2770	.0146	.0033	.0070
.6445	-1.296	.2817	.0164	-.0033	.0072	.6458	1.419	.2961	.0164	.0036	.0075
.7161	-1.374	.2968	.0182	-.0035	.0075	.7175	1.507	.3121	.0182	.0030	.0079
.7877	-1.438	.3092	.0200	-.0037	.0079	.7893	1.580	.3255	.0200	.0040	.0083
.8593	-1.488	.3190	.0218	-.0038	.0081	.8611	1.639	.3361	.0219	.0042	.0095
.9309	-1.524	.3262	.0236	-.0039	.0083	.9328	1.683	.3441	.0237	.0043	.0097
1.0025	-1.545	.3308	.0255	-.0039	.0084	1.0046	1.712	.3493	.0255	.0043	.0089
1.0741	-1.553	.3327	.0273	-.0039	.0085	1.0763	1.725	.3518	.0273	.0044	.0089
1.1458	-1.548	.3322	.0291	-.0039	.0084	1.1481	1.723	.3516	.0292	.0044	.0089
1.2174	-1.530	.3293	.0309	-.0039	.0084	1.2198	1.706	.3489	.0310	.0043	.0089
1.2890	-1.499	.3239	.0327	-.0038	.0082	1.2916	1.676	.3435	.0328	.0043	.0087
1.3606	-1.456	.3160	.0346	-.0037	.0080	1.3633	1.631	.3354	.0346	.0041	.0085
1.4322	-1.401	.3057	.0364	-.0036	.0078	1.4351	1.571	.3248	.0365	.0040	.0082
1.5038	-1.333	.2928	.0382	-.0034	.0074	1.5068	1.498	.3114	.0383	.0038	.0079
1.5754	-1.252	.2773	.0400	-.0032	.0070	1.5786	1.410	.2952	.0401	.0036	.0075
1.6470	-1.158	.2592	.0418	-.0029	.0066	1.6504	1.307	.2762	.0419	.0033	.0070
1.7186	-1.052	.2384	.0437	-.0027	.0061	1.7221	1.189	.2543	.0437	.0030	.0065
1.7902	-.933	.2147	.0455	-.0024	.0055	1.7939	1.057	.2293	.0456	.0027	.0058
1.8618	-.800	.1882	.0473	-.0020	.0048	1.8656	.909	.2012	.0474	.0023	.0051
1.9335	-.655	.1587	.0491	-.0017	.0040	1.9374	.746	.1698	.0492	.0019	.0043
2.0051	-.496	.1259	.0509	-.0013	.0032	2.0091	.568	.1349	.0510	.0014	.0034
2.0767	-.323	.0999	.0527	-.0008	.0023	2.0803	.374	.0964	.0529	.0009	.0024
2.1483	-.137	.0504	.0546	-.0002	.0013	2.1526	.133	.0539	.0547	.0004	.0014
2.2135	-.0043	.0111	.0562	-.0001	.0003	2.2182	-.0042	.0114	.0563	-.0001	.0003
2.2199	-.061	.0073	.0564	-.0002	.0002	2.2244	-.061	.0074	.0565	-.0002	.0002

RADIUS (INCHES) = 16.450		CHORD (INCHES) = 2.220	ZCSL (INCHES) = 1.1095	YCSL (INCHES) = .1321	RLE (INCHES) = .0073
RTE (INCHES) = .0070		X-AREA (SQ. IN.) = .2801	GAMMA-CHORD(DEG.) = 13.57		

RADIUS (METERS) = .4176		CHORD (METERS) = .0564	ZCSL (METERS) = .0282	YCSL (METERS) = .0049	RLE (METERS) = .000184
RTE (METERS) = .000178		X-AREA (SQ.METERS) = .000181	GAMMA-CHORD(RAD.) = .3240		

RADIUS (INCHES) = 16.650		CHORD (INCHES) = 2.224	ZCSL (INCHES) = 1.1121	YCSL (INCHES) = .2062	RLE (INCHES) = .0074
RTE (INCHES) = .0070		X-AREA (SQ. IN.) = .2847	GAMMA-CHORD(DEG.) = 18.81		

RADIUS (METERS) = .4229		CHORD (METERS) = .0565	ZCSL (METERS) = .0282	YCSL (METERS) = .0052	RLE (METERS) = .000188
RTE (METERS) = .000177		X-AREA (SQ.METERS) = .000184	GAMMA-CHORD(RAD.) = .3283		

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TABLE XXVI

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0111	.0136	.0000	-.0003	.0003	.0000	-.0113	.0132	.0000	-.0003	.0003
.0110	-.0073	.0210	.0003	-.0002	.0005	.0113	-.0077	.0204	.0003	-.0006	.0005
.1042	-.0248	.0839	.0026	-.0006	.0021	.1046	-.0219	.0794	.0027	-.0006	.0020
.2083	.0615	.1529	.0053	.0016	.0039	.2092	.0556	.1443	.0053	.0014	.0037
.3125	.0988	.2199	.0079	.0025	.0056	.3137	.0900	.2074	.0080	.0023	.0053
.4167	.1359	.2851	.0106	.0035	.0072	.4183	.1244	.2689	.0106	.0032	.0068
.5209	.1736	.3483	.0132	.0044	.0088	.5229	.1593	.3284	.0133	.0040	.0083
.6251	.2128	.4099	.0159	.0054	.0104	.6275	.1951	.3862	.0159	.0050	.0098
.7292	.2526	.4696	.0185	.0064	.0119	.7320	.2315	.4422	.0186	.0059	.0112
.8334	.2926	.5293	.0212	.0074	.0134	.8366	.2682	.4971	.0213	.0068	.0126
.9376	.3336	.5853	.0238	.0085	.0149	.9412	.3058	.5504	.0239	.0078	.0140
1.0418	.3747	.6378	.0265	.0095	.0152	1.0458	.3435	.6000	.0266	.0087	.0152
1.1459	.4135	.6854	.0291	.0105	.0174	1.1503	.3796	.6452	.0292	.0096	.0164
1.2501	.4503	.7259	.0318	.0114	.0184	1.2549	.4179	.6839	.0319	.0105	.0178
1.3543	.4803	.7599	.0344	.0122	.0193	1.3595	.4419	.7164	.0345	.0112	.0182
1.4585	.5068	.7875	.0370	.0129	.0200	1.4641	.4866	.7428	.0372	.0119	.0189
1.5626	.5282	.8092	.0397	.0134	.0206	1.5687	.4867	.7635	.0398	.0124	.0194
1.6668	.5489	.8246	.0423	.0139	.0209	1.6732	.5023	.7783	.0425	.0128	.0198
1.7710	.5567	.8340	.0450	.0141	.0212	1.7778	.5133	.7872	.0452	.0130	.0200
1.8752	.5833	.8373	.0476	.0148	.0213	1.8824	.5195	.7904	.0478	.0132	.0201
1.9793	.5647	.8342	.0503	.0143	.0212	1.9870	.5208	.7874	.0505	.0132	.0200
2.0835	.5605	.8246	.0529	.0142	.0209	2.0915	.5170	.7782	.0531	.0131	.0198
2.1877	.5507	.8082	.0556	.0140	.0205	2.1961	.5078	.7624	.0558	.0129	.0194
2.2919	.5346	.7844	.0582	.0136	.0199	2.3007	.4929	.7397	.0584	.0125	.0188
2.3960	.5121	.7528	.0609	.0130	.0191	2.4053	.4719	.7094	.0611	.0120	.0180
2.5002	.4824	.7125	.0635	.0123	.0181	2.5093	.4443	.6709	.0638	.0113	.0170
2.6044	.4449	.6623	.0662	.0113	.0168	2.6144	.4094	.6231	.0664	.0104	.0158
2.7086	.3987	.6011	.0688	.0101	.0153	2.7190	.3665	.5649	.0691	.0093	.0143
2.8127	.3427	.5268	.0714	.0087	.0134	2.8236	.3146	.4944	.0717	.0080	.0126
2.9169	.2755	.4368	.0741	.0070	.0111	2.9282	.2525	.4093	.0744	.0064	.0104
3.0211	.1952	.3270	.0767	.0050	.0083	3.0327	.1784	.3060	.0770	.0045	.0078
3.1253	.0994	.1911	.0794	.0025	.0049	3.1373	.0902	.1787	.0797	.0023	.0045
3.2235	-.0069	.0297	.0819	-.0002	.0008	3.2352	-.0068	.0296	.0822	-.0002	.0008
3.2294	-.0134	.0198	.0820	-.0003	.0005	3.2419	-.0134	.0194	.0823	-.0003	.0005

RADIUS (INCHES) = 8.286	RADIUS (METERS) = .2105	RADIUS (INCHES) = 8.431	RADIUS (METERS) = .2141
CHORD (INCHES) = 3.229	CHORD (METERS) = .0820	CHORD (INCHES) = 3.242	CHORD (METERS) = .0824
ZCSL (INCHES) = 1.6552	ZCSL (METERS) = .0420	ZCSL (INCHES) = 1.6694	ZCSL (METERS) = .0423
YCSL (INCHES) = .5274	YCSL (METERS) = .0134	YCSL (INCHES) = .4933	YCSL (METERS) = .0125
LER (INCHES) = .0125	LER (METERS) = .000317	LER (INCHES) = .0126	LER (METERS) = .000320
TER (INCHES) = .0108	TER (METERS) = .000274	TER (INCHES) = .0113	TER (METERS) = .000287
X-AREA (SQ. IN.) = .6796	X-AREA(SQ.METERS)= .000438	X-AREA (SQ. IN.) = .6687	X-AREA(SQ.METERS)= .000431
GAMMA-CHORD(DEG.)= 18.70	GAMMA-CHORD(RAD.)= .3264	GAMMA-CHORD(DEG.)= 19.57	GAMMA-CHORD(RAD.)= .3415

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0113	.0127	.0000	-.0003	.0003
-.0114	-.0079	.0194	.0003	-.0002	.0005
.1052	-.0194	.0747	.0027	-.0005	.0019
.2105	.0501	.1350	.0053	.0013	.0034
.3157	.0808	.1932	.0080	.0021	.0049
.4209	.1116	.2494	.0107	.0028	.0063
.5262	.1424	.3036	.0134	.0036	.0077
.6314	.1734	.3560	.0160	.0044	.0090
.7366	.2048	.4066	.0187	.0052	.0103
.8418	.2365	.4559	.0214	.0060	.0116
.9471	.2690	.5035	.0241	.0068	.0128
1.0523	.3016	.5487	.0267	.0077	.0139
1.1575	.3337	.5903	.0294	.0085	.0150
1.2628	.3634	.6260	.0321	.0092	.0159
1.3690	.3891	.6561	.0347	.0099	.0167
1.4732	.4111	.6806	.0374	.0104	.0173
1.5785	.4291	.6998	.0401	.0109	.0178
1.6837	.4429	.7134	.0428	.0112	.0181
1.7889	.4526	.7216	.0454	.0115	.0183
1.8942	.4580	.7243	.0481	.0116	.0184
1.9994	.4592	.7212	.0508	.0117	.0183
2.1046	.4558	.7123	.0535	.0116	.0181
2.2099	.4472	.6973	.0561	.0114	.0177
2.3151	.4336	.6757	.0588	.0110	.0172
2.4203	.4147	.6473	.0615	.0105	.0164
2.5256	.3901	.6112	.0641	.0099	.0155
2.6308	.3590	.5665	.0668	.0091	.0144
2.7360	.3209	.5128	.0695	.0081	.0130
2.8413	.2743	.4475	.0722	.0070	.0114
2.9465	.2197	.3691	.0748	.0056	.0094
3.0517	.1543	.2748	.0775	.0039	.0070
3.1569	.0769	.1600	.0802	.0020	.0041
3.2544	-.0067	.0287	.0827	-.0002	.0007
3.2622	-.0133	.0183	.0829	-.0003	.0005

RADIUS (INCHES)	= 8.646	RADIUS (METERS)	= .2196
CHORD (INCHES)	= 3.262	CHORD (METERS)	= .0829
ZCSL (INCHES)	= 1.6778	ZCSL (METERS)	= .0426
YCSL (INCHES)	= .4458	YCSL (METERS)	= .0113
LER (INCHES)	= .0124	LER (METERS)	= .000315
TER (INCHES)	= .0118	TER (METERS)	= .000300
X-AREA (SQ. IN.)	= .6524	X-AREA(SQ.METERS)	= .000421
GAMMA-CHORD(DEG.)	= 20.87	GAMMA-CHORD(RAD.)	= .3642

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0111	.0125	.0000	-.0003	.0003
.0113	-.0080	.0189	.0003	-.0002	.0005
.0556	-.0180	.0721	.0027	-.0005	.0018
.2111	.0471	.1299	.0054	.0012	.0033
.3167	.0760	.1855	.0080	.0019	.0047
.4222	.1048	.2392	.0107	.0027	.0061
.5278	.1337	.2907	.0134	.0034	.0074
.6334	.1625	.3404	.0161	.0041	.0086
.7389	.1914	.3881	.0188	.0049	.0099
.8445	.2205	.4343	.0215	.0056	.0110
.9501	.2499	.4787	.0241	.0063	.0122
1.0556	.2733	.5211	.0268	.0071	.0132
1.1612	.3088	.5603	.0295	.0078	.0142
1.2667	.3360	.5940	.0322	.0085	.0151
1.3723	.3598	.6226	.0349	.0091	.0158
1.4779	.3800	.6458	.0375	.0097	.0164
1.5834	.3966	.6639	.0402	.0101	.0169
1.6890	.4094	.6767	.0429	.0104	.0172
1.7945	.4184	.6843	.0456	.0106	.0174
1.9001	.4234	.6867	.0483	.0108	.0174
2.0057	.4242	.6835	.0509	.0108	.0174
2.1112	.4208	.6747	.0536	.0107	.0171
2.2168	.4129	.6601	.0563	.0105	.0168
2.3224	.4002	.6392	.0590	.0102	.0162
2.4279	.3825	.6117	.0617	.0097	.0155
2.5335	.3593	.5769	.0644	.0091	.0147
2.6390	.3302	.5342	.0670	.0084	.0136
2.7446	.2946	.4825	.0697	.0075	.0123
2.8502	.2519	.4205	.0724	.0064	.0107
2.9557	.2009	.3464	.0751	.0051	.0088
3.0613	.1407	.2576	.0778	.0036	.0065
3.1668	.0697	.1500	.0804	.0018	.0038
3.2681	-.0065	.0284	.0829	-.0002	.0007
3.2729	-.0131	.0180	.0831	-.0003	.0005

RADIUS (INCHES)	= 8.773	RADIUS (METERS)	= .2226
CHORD (INCHES)	= 3.272	CHORD (METERS)	= .0831
ZCSL (INCHES)	= 1.6845	ZCSL (METERS)	= .0428
YCSL (INCHES)	= .4190	YCSL (METERS)	= .0106
LER (INCHES)	= .0123	LER (METERS)	= .000312
TER (INCHES)	= .0122	TER (METERS)	= .000310
X-AREA (SQ. IN.)	= .6426	X-AREA(SQ.METERS)	= .000415
GAMMA-CHORD(DEG.)	= 21.67	GAMMA-CHORD(RAD.)	= .3781

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TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)				English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS		ZC	YP	YS	ZC	YP	YS
.0000	-.0109	.0120	.0000	-.0003	.0003		-.0000	-.0108	.0118	.0000	-.0003	.0003
.0112	-.0031	.0178	.0003	-.0002	.0005		.0112	-.0082	.0171	.0003	-.0002	.0004
.1065	.0155	.0668	.0027	.0004	.0017		.1071	.0135	.0630	.0027	.0003	.0016
.2130	.0415	.1196	.0054	.0011	.0030		.2142	.0373	.1128	.0054	.0009	.0029
.3195	.0670	.1700	.0081	.0017	.0043		.3213	.0603	.1593	.0082	.0015	.0040
.4260	.0920	.2180	.0108	.0023	.0055		.4285	.0828	.2039	.0109	.0021	.0052
.5326	.1163	.2636	.0135	.0030	.0067		.5356	.1047	.2462	.0136	.0027	.0063
.6391	.1401	.3070	.0162	.0036	.0078		.6427	.1260	.2863	.0163	.0032	.0073
.7456	.1636	.3482	.0189	.0042	.0088		.7498	.1467	.3242	.0190	.0037	.0082
.8521	.1867	.3875	.0216	.0047	.0098		.8569	.1670	.3600	.0218	.0042	.0091
.9586	.2037	.4248	.0243	.0053	.0108		.9640	.1867	.3950	.0245	.0047	.0100
1.0651	.2324	.4607	.0271	.0059	.0117		1.0711	.2059	.4258	.0272	.0052	.0108
1.1716	.2553	.4937	.0298	.0065	.0125		1.1783	.2251	.4552	.0299	.0057	.0116
1.2781	.2763	.5225	.0325	.0070	.0133		1.2854	.2427	.4813	.0326	.0062	.0122
1.3947	.2948	.5469	.0352	.0075	.0139		1.3925	.2582	.5033	.0354	.0066	.0128
1.4912	.3104	.5665	.0379	.0079	.0144		1.4996	.2712	.5207	.0381	.0069	.0132
1.5977	.3230	.5814	.0406	.0082	.0148		1.6067	.2815	.5339	.0408	.0072	.0136
1.7042	.3324	.5917	.0433	.0084	.0150		1.7138	.2891	.5426	.0435	.0073	.0138
1.8107	.3388	.5971	.0460	.0086	.0152		1.8210	.2940	.5469	.0463	.0075	.0139
1.9172	.3418	.5977	.0487	.0087	.0152		1.9281	.2960	.5467	.0490	.0075	.0139
2.0237	.3414	.5934	.0514	.0087	.0151		2.0352	.2952	.5420	.0517	.0075	.0138
2.1302	.3375	.5841	.0541	.0086	.0148		2.1423	.2913	.5326	.0544	.0074	.0135
2.2367	.3299	.5695	.0568	.0084	.0145		2.2494	.2842	.5184	.0571	.0072	.0132
2.3433	.3195	.5494	.0595	.0081	.0140		2.3565	.2738	.4992	.0599	.0070	.0127
2.4498	.3030	.5235	.0622	.0077	.0133		2.4636	.2599	.4746	.0626	.0066	.0121
2.5563	.2833	.4914	.0649	.0072	.0125		2.5708	.2423	.4444	.0653	.0062	.0113
2.6628	.2590	.4526	.0676	.0066	.0115		2.6779	.2208	.4081	.0680	.0056	.0104
2.7693	.2298	.4065	.0703	.0058	.0103		2.7850	.1951	.3651	.0707	.0050	.0091
2.8758	.1953	.3521	.0730	.0050	.0089		2.8921	.1648	.3146	.0735	.0042	.0080
2.9823	.1546	.2882	.0758	.0039	.0073		2.9992	.1294	.2558	.0762	.0033	.0065
3.0889	.1070	.2127	.0785	.0027	.0054		3.1063	.0886	.1875	.0789	.0022	.0048
3.1954	.0516	.1232	.0812	.0013	.0031		3.2135	.0415	.1077	.0816	.0011	.0027
3.2922	-.0066	.0258	.0836	-.0002	.0007		3.3104	-.0067	.0236	.0841	-.0002	.0006
3.3019	-.0124	.0161	.0839	-.0003	.0004		3.3206	-.0118	.0148	.0843	-.0003	.0004

RADIUS	(INCHES)	=	9.116		RADIUS	(METERS)	=	.2315		RADIUS	(INCHES)	=	9.354		RADIUS	(METERS)	=	.2376
CHORD	(INCHES)	=	3.302		CHORD	(METERS)	=	.0839		CHORD	(INCHES)	=	3.321		CHORD	(METERS)	=	.0843
ZCSL	(INCHES)	=	1.6996		ZCSL	(METERS)	=	.0432		ZCSL	(INCHES)	=	1.7091		ZCSL	(METERS)	=	.0434
YCSL	(INCHES)	=	-.3564		YCSL	(METERS)	=	.0091		YCSL	(INCHES)	=	.3205		YCSL	(METERS)	=	.0081
LER	(INCHES)	=	.0120		LER	(METERS)	=	.000305		LER	(INCHES)	=	.0119		LER	(METERS)	=	.000302
TER	(INCHES)	=	.0125		TER	(METERS)	=	.000317		TER	(INCHES)	=	.0124		TER	(METERS)	=	.000315
X-AREA (SQ. IN.)		=	.6175		X-AREA(SQ.METERS)		=	.000398		X-AREA (SQ. IN.)		=	.6013		X-AREA(SQ.METERS)		=	.000388
GAMMA-CHORD(DEG.)		=	23.90		GAMMA-CHORD(RAD.)		=	.4172		GAMMA-CHORD(DEG.)		=	25.56		GAMMA-CHORD(RAD.)		=	.4460

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

First station

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0106	.0116	.0000	-.0003	.0003
.0111	-.0083	.0167	.0003	-.0002	.0004
.1078	-.0123	.0608	.0027	-.0003	.0015
.2198	-.0387	.1082	.0055	-.0009	.0027
.3223	-.0564	.1532	.0082	-.0014	.0039
.4297	-.0774	.1959	.0109	-.0020	.0050
.5371	-.0978	.2362	.0136	-.0025	.0060
.6446	-.1175	.2744	.0164	-.0030	.0070
.7520	-.1366	.3104	.0191	-.0035	.0079
.8594	-.1552	.3442	.0218	-.0039	.0087
.9668	-.1731	.3761	.0246	-.0044	.0096
1.0743	-.1905	.4061	.0273	-.0048	.0103
1.1817	-.2077	.4336	.0300	-.0053	.0110
1.2891	-.2235	.4582	.0327	-.0057	.0116
1.3965	-.2375	.4788	.0355	-.0060	.0122
1.5040	-.2491	.4951	.0382	-.0063	.0126
1.6814	-.2582	.5073	.0409	-.0066	.0129
1.7188	-.2649	.5152	.0437	-.0067	.0131
1.8263	-.2690	.5189	.0464	-.0068	.0132
1.9337	-.2705	.5183	.0491	-.0069	.0132
2.0411	-.2693	.5134	.0518	-.0068	.0130
2.1485	-.2653	.5039	.0546	-.0067	.0128
2.2560	-.2584	.4899	.0573	-.0066	.0124
2.3634	-.2484	.4710	.0600	-.0063	.0120
2.4708	-.2353	.4470	.0628	-.0060	.0114
2.5782	-.2188	.4177	.0655	-.0056	.0106
2.6857	-.1988	.3827	.0682	-.0050	.0097
2.7931	-.1750	.3415	.0709	-.0044	.0087
2.9005	-.1473	.2935	.0737	-.0037	.0075
3.0080	-.1152	.2380	.0764	-.0029	.0060
3.1154	-.0783	.1738	.0791	-.0020	.0044
3.2228	-.0361	.0997	.0819	-.0009	.0025
3.3198	-.0068	.0224	.0843	-.0002	.0036
3.3303	-.0114	.0141	.0846	-.0003	.0004

RADIUS	(INCHES)	=	9.484	RADIUS	(METERS)	=	.2408
CHORD	(INCHES)	=	3.330	CHORD	(METERS)	=	.0846
ZCSL	(INCHES)	=	1.7142	ZCSL	(METERS)	=	.0435
YCSL	(INCHES)	=	.3001	YCSL	(METERS)	=	.0076
LER	(INCHES)	=	.0118	LER	(METERS)	=	.000300
TER	(INCHES)	=	.0123	TER	(METERS)	=	.000312
X-AREA	(SQ. IN.)	=	.5927	X-AREA	(SQ.METERS)	=	.000382
GAMMA-CHORD	(DEG.)	=	26.55	GAMMA-CHORD	(RAD.)	=	.4634

Second station

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0105	.0114	.0000	-.0003	.0003
.0111	-.0083	.0162	.0003	-.0002	.0004
.1079	-.0109	.0581	.0027	-.0003	.0015
.2157	-.0317	.1029	.0055	-.0008	.0026
.3236	-.0517	.1454	.0082	-.0013	.0037
.4318	-.0710	.1856	.0110	-.0018	.0047
.5393	-.0895	.2234	.0137	-.0023	.0057
.6472	-.1072	.2590	.0164	-.0027	.0066
.7550	-.1240	.2923	.0192	-.0031	.0074
.8629	-.1401	.3234	.0219	-.0036	.0082
.9707	-.1556	.3525	.0247	-.0040	.0090
1.0786	-.1705	.3796	.0274	-.0043	.0096
1.1865	-.1849	.4045	.0301	-.0047	.0103
1.2943	-.1982	.4269	.0329	-.0050	.0108
1.4022	-.2099	.4456	.0356	-.0053	.0113
1.5100	-.2196	.4603	.0384	-.0056	.0117
1.6179	-.2271	.4711	.0411	-.0058	.0120
1.7258	-.2324	.4779	.0438	-.0059	.0121
1.8336	-.2354	.4807	.0466	-.0060	.0122
1.9415	-.2361	.4795	.0493	-.0060	.0122
2.0493	-.2345	.4742	.0521	-.0060	.0120
2.1572	-.2304	.4647	.0548	-.0059	.0118
2.2651	-.2237	.4508	.0575	-.0057	.0115
2.3729	-.2145	.4326	.0603	-.0054	.0110
2.4808	-.2025	.4097	.0630	-.0051	.0104
2.5886	-.1877	.3819	.0658	-.0048	.0097
2.6965	-.1698	.3489	.0685	-.0043	.0089
2.8044	-.1488	.3104	.0712	-.0038	.0079
2.9122	-.1245	.2658	.0740	-.0032	.0068
3.0201	-.0966	.2147	.0767	-.0025	.0055
3.1280	-.0649	.1562	.0795	-.0016	.0040
3.2358	-.0290	.0894	.0822	-.0007	.0023
3.3330	-.0071	.0207	.0847	-.0002	.0005
3.3437	-.0110	.0132	.0849	-.0003	.0003

RADIUS	(INCHES)	=	9.684	RADIUS	(METERS)	=	.2460
CHORD	(INCHES)	=	3.344	CHORD	(METERS)	=	.0849
ZCSL	(INCHES)	=	1.7216	ZCSL	(METERS)	=	.0437
YCSL	(INCHES)	=	.2726	YCSL	(METERS)	=	.0069
LER	(INCHES)	=	.0116	LER	(METERS)	=	.000235
TER	(INCHES)	=	.0121	TER	(METERS)	=	.000307
X-AREA	(SQ. IN.)	=	.5799	X-AREA	(SQ.METERS)	=	.000374
GAMMA-CHORD	(DEG.)	=	28.10	GAMMA-CHORD	(RAD.)	=	.4904

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.000C	-.010C	.0112	.0000	-.0003	.0003	.0000	-.0102	.0110	.0000	-.0003	.0003
.0110	-.0083	.0157	.0003	-.0002	.0004	.0109	-.0083	.0153	.0003	-.0002	.0004
.1082	.0097	.0559	.0027	.0002	.0014	.1084	.0086	.0538	.0028	.0002	.0014
.2163	.0291	.0988	.0055	.0007	.0025	.2169	.0268	.0950	.0055	.0007	.0024
.3285	.0478	.1394	.0082	.0012	.0035	.3253	.0442	.1337	.0083	.0011	.0034
.4326	.0657	.1777	.0110	.0017	.0045	.4337	.0608	.1703	.0110	.0015	.0043
.5408	.0828	.2138	.0137	.0021	.0054	.5421	.0767	.2048	.0138	.0019	.0052
.6489	.0992	.2477	.0165	.0025	.0063	.6506	.0918	.2371	.0165	.0023	.0060
.7571	.1148	.2794	.0192	.0029	.0071	.7590	.1062	.2673	.0193	.0027	.0068
.8652	.1237	.3090	.0220	.0033	.0078	.8674	.1199	.2955	.0220	.0030	.0075
.9734	.1438	.3365	.0247	.0037	.0085	.9759	.1328	.3216	.0248	.0034	.0082
1.0816	.1573	.3621	.0275	.0040	.0092	1.0843	.1451	.3458	.0275	.0037	.0088
1.1897	.1701	.3854	.0302	.0043	.0098	1.1927	.1566	.3678	.0303	.0040	.0093
1.2979	.1819	.4064	.0330	.0046	.0103	1.3012	.1673	.3877	.0330	.0042	.0098
1.4060	.1923	.4239	.0357	.0049	.0108	1.4096	.1766	.4042	.0358	.0045	.0103
1.5142	.2006	.4376	.0385	.0051	.0111	1.5180	.1851	.4172	.0386	.0047	.0106
1.6223	.2070	.4473	.0412	.0053	.0114	1.6264	.1897	.4263	.0413	.0048	.0108
1.7305	.2113	.4533	.0440	.0054	.0115	1.7349	.1934	.4318	.0441	.0049	.0110
1.8387	.2136	.4555	.0467	.0054	.0116	1.8433	.1951	.4336	.0468	.0050	.0110
1.9468	.2139	.4538	.0494	.0054	.0115	1.9517	.1949	.4316	.0496	.0049	.0110
2.0550	.2119	.4483	.0522	.0054	.0114	2.0602	.1926	.4259	.0523	.0049	.0108
2.1631	.2078	.4388	.0549	.0053	.0111	2.1686	.1883	.4162	.0551	.0048	.0106
2.2713	.2013	.4252	.0577	.0051	.0108	2.2770	.1820	.4027	.0578	.0046	.0102
2.3794	.1925	.4073	.0604	.0049	.0103	2.3855	.1735	.3852	.0606	.0044	.0098
2.4876	.1813	.3851	.0632	.0046	.0098	2.4939	.1628	.3635	.0633	.0041	.0092
2.5958	.1616	.3584	.0659	.0041	.0091	2.6023	.1500	.3375	.0661	.0038	.0086
2.7039	.1512	.3268	.0687	.0038	.0083	2.7107	.1348	.3071	.0689	.0034	.0078
2.8121	.1320	.2901	.0714	.0034	.0074	2.8192	.1173	.2719	.0716	.0030	.0069
2.9202	.1100	.2478	.0742	.0028	.0063	2.9276	.0973	.2318	.0744	.0025	.0059
3.0284	.0848	.1996	.0769	.0022	.0051	3.0360	.0746	.1864	.0771	.0019	.0047
3.1365	.0564	.1449	.0797	.0014	.0037	3.1445	.0491	.1349	.0799	.0012	.0034
3.2447	.0245	.0828	.0824	.0006	.0021	3.2529	.0207	.0770	.0826	.0005	.0020
3.3421	-.0073	.0197	.0849	-.0002	.0005	3.3505	-.0074	.0187	.0851	-.0002	.0005
3.3529	-.0103	.0128	.0852	-.0003	.0003	3.3613	-.0105	.0123	.0854	-.0003	.0003

English Units (Inches)		SI Units (Meters)		English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) = 9.833		RADIUS (METERS) = .2498		RADIUS (INCHES) = 9.983		RADIUS (METERS) = .2536	
CHORD (INCHES) = 3.353		CHORD (METERS) = .0852		CHORD (INCHES) = 3.361		CHORD (METERS) = .0854	
ZCSL (INCHES) = 1.1265		ZCSL (METERS) = .0435		ZCSL (INCHES) = 1.7310		ZCSL (METERS) = .0440	
YCSL (INCHES) = .2545		YCSL (METERS) = .0065		YCSL (INCHES) = .2382		YCSL (METERS) = .0061	
LER (INCHES) = .0115		LER (METERS) = .000292		LER (INCHES) = .0113		LER (METERS) = .000287	
TER (INCHES) = .0120		TER (METERS) = .000305		TER (INCHES) = .0119		TER (METERS) = .000302	
X-AREA (SQ. IN.) = .5707		X-AREA(SQ.METERS) = .000368		X-AREA (SQ. IN.) = .5618		X-AREA(SQ.METERS) = .000362	
GAMMA-CHORD(DEG.) = 29.23		GAMMA-CHORD(RAD.) = .5102		GAMMA-CHORD(DEG.) = 30.33		GAMMA-CHORD(RAD.) = .5294	

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — ROTOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0100	.0106	.0000	-.0003	.0003	.0000	-.0098	.0104	.0000	-.0002	.0003
.0106	-.008	.0145	.0003	-.0002	.0004	.0105	-.0084	.0139	.0003	-.0002	.0004
.1088	-.0064	.0503	.0028	-.0002	.0013	.1092	-.0052	.0471	.0028	-.0001	.0012
.2177	-.0229	.0882	.0055	-.0006	.0022	.2184	-.0196	.0822	.0055	-.0005	.0021
.3265	-.0382	.1240	.0083	.0010	.0031	.3275	-.0331	.1152	.0083	-.0008	.0029
.4353	-.0528	.1577	.0111	.0013	.0040	.4367	-.0459	.1462	.0111	-.0012	.0037
.5442	-.0667	.1893	.0138	.0017	.0048	.5459	-.0580	.1754	.0139	-.0015	.0045
.6530	-.0799	.2190	.0166	.0020	.0056	.6551	-.0693	.2026	.0166	-.0018	.0051
.7618	-.0923	.2466	.0194	.0023	.0063	.7643	-.0800	.2280	.0194	-.0020	.0058
.8707	-.1040	.2723	.0221	.0026	.0059	.8734	-.0900	.2515	.0222	-.0023	.0064
.9795	-.1149	.2961	.0249	.0029	.0075	.9826	-.0993	.2732	.0250	-.0025	.0069
1.0883	-.1252	.3180	.0276	.0032	.0081	1.0918	-.1078	.2931	.0277	-.0027	.0074
1.1971	-.1348	.3379	.0304	.0034	.0086	1.2010	-.1157	.3111	.0305	-.0029	.0079
1.3060	-.1436	.3560	.0332	.0036	.0090	1.3102	-.1230	.3276	.0333	-.0031	.0083
1.4148	-.1513	.3712	.0359	.0038	.0094	1.4193	-.1294	.3414	.0361	-.0033	.0087
1.5236	-.1575	.3830	.0387	.0040	.0097	1.5285	-.1344	.3523	.0388	-.0034	.0089
1.6325	-.1621	.3913	.0415	.0041	.0099	1.6377	-.1381	.3600	.0416	-.0035	.0091
1.7413	-.1649	.3962	.0442	.0042	.0101	1.7469	-.1403	.3644	.0444	-.0036	.0093
1.8501	-.1661	.3976	.0470	.0042	.0101	1.8561	-.1411	.3655	.0471	-.0036	.0093
1.9590	-.1656	.3955	.0498	.0041	.0100	1.9653	-.1404	.3634	.0499	-.0036	.0092
2.0678	-.1634	.3899	.0525	.0041	.0099	2.0744	-.1382	.3580	.0527	-.0035	.0091
2.1766	-.1594	.3808	.0553	.0040	.0097	2.1836	-.1345	.3493	.0555	-.0034	.0089
2.2955	-.1536	.3679	.0581	.0039	.0093	2.2928	-.1294	.3373	.0582	-.0033	.0086
2.3943	-.1460	.3514	.0608	.0037	.0089	2.4020	-.1227	.3218	.0610	-.0031	.0082
2.5031	-.1366	.3311	.0636	.0035	.0084	2.5112	-.1145	.3029	.0638	-.0029	.0077
2.6120	-.1253	.3069	.0663	.0032	.0078	2.6203	-.1047	.2804	.0666	-.0027	.0071
2.7208	-.1121	.2787	.0691	.0028	.0071	2.7295	-.0933	.2542	.0693	-.0024	.0065
2.8296	-.0969	.2461	.0719	.0025	.0063	2.8387	-.0803	.2242	.0721	-.0020	.0057
2.9385	-.0797	.2092	.0746	.0020	.0053	2.9479	-.0656	.1903	.0749	-.0017	.0048
3.0473	-.0604	.1676	.0774	.0015	.0043	3.0571	-.0493	.1522	.0776	-.0013	.0039
3.1561	-.0390	.1210	.0802	.0010	.0031	3.1662	-.0312	.1098	.0804	-.0008	.0028
3.2650	-.0152	.0689	.0829	.0004	.0017	3.2584	-.0114	.0627	.0832	-.0003	.0016
3.3629	-.0077	.0178	.0854	-.0002	.0004	3.3739	-.0078	.0162	.0857	-.0002	.0004
3.3738	-.0103	.0117	.0857	-.0003	.0003	3.3846	-.0099	.0111	.0860	-.0003	.0003

RADIUS (INCHES)	= 10.283		RADIUS (METERS)	= .2612		RADIUS (INCHES)	= 10.582		RADIUS (METERS)	= .2688	
CHORD (INCHES)	= 3.378		CHORD (METERS)	= .0857		CHORD (INCHES)	= 3.385		CHORD (METERS)	= .0860	
ZCSL (INCHES)	= 1.7394		ZCSL (METERS)	= .0442		ZCSL (INCHES)	= 1.7468		ZCSL (METERS)	= .0444	
YCSL (INCHES)	= -.2124		YCSL (METERS)	= -.0054		YCSL (INCHES)	= -.1894		YCSL (METERS)	= -.0048	
LER (INCHES)	= .0110		LER (METERS)	= .000279		LER (INCHES)	= .0108		LER (METERS)	= .000274	
TER (INCHES)	= .0117		TER (METERS)	= .000297		TER (INCHES)	= .0113		TER (METERS)	= .000287	
X-AREA (SQ. IN.)	= .5443		X-AREA(SQ.METERS)	= .000351		X-AREA (SQ. IN.)	= .5268		X-AREA(SQ.METERS)	= .000340	
GAMMA-CHORD(DEG.)	= 32.36		GAMMA-CHORD(RAD.)	= .5648		GAMMA-CHORD(DEG.)	= 34.35		GAMMA-CHORD(RAD.)	= .5995	

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
.0000	-.0095	.0100	.0000	-.0002	.0013	.0000	-.0093	.0097	.0000	-.0002	.0002
.0102	-.0083	.0131	.0003	-.0002	.0003	.0100	.0084	-.0123	.0003	-.0002	.0003
.1096	-.0032	.0430	.0028	-.0001	.0011	.1099	-.0009	-.0385	.0028	-.0000	.0010
.2191	-.0154	.0747	.0056	.0004	.0019	.2199	-.0106	-.0661	.0056	-.0003	.0017
.3287	-.0268	.1045	.0093	-.0007	.0027	.3298	-.0192	-.0922	.0084	-.0005	.0023
.4382	-.0376	.1325	.0111	.0010	.0034	.4398	-.0282	-.1166	.0112	-.0007	.0030
.5478	-.0477	.1587	.0139	-.0012	.0040	.5497	-.0359	-.1393	.0140	-.0009	.0035
.6574	-.0572	.1832	.0167	-.0015	.0047	.6596	-.0430	-.1604	.0168	-.0011	.0041
.7669	-.0659	.2059	.0195	-.0017	.0052	.7696	-.0495	-.1800	.0195	-.0013	.0046
.8765	-.0740	.2269	.0223	-.0019	.0058	.8795	-.0555	-.1981	.0223	-.0014	.0050
.9860	-.0814	.2462	.0250	-.0021	.0063	.9895	-.0609	-.2147	.0251	-.0015	.0055
1.0956	-.0882	.2638	.0278	-.0022	.0067	1.0994	-.0657	-.2297	.0279	-.0017	.0058
1.2052	-.0943	.2797	.0306	-.0024	.0071	1.2093	-.0699	-.2433	.0307	-.0018	.0062
1.3147	-.0998	.2941	.0334	-.0025	.0075	1.3193	-.0736	-.2554	.0335	-.0019	.0065
1.4243	-.1045	.3064	.0362	-.0027	.0078	1.4292	-.0768	-.2661	.0363	-.0020	.0068
1.5339	-.1082	.3162	.0390	-.0027	.0080	1.5392	-.0793	-.2747	.0391	-.0020	.0070
1.6434	-.1109	.3230	.0417	-.0028	.0082	1.6491	-.0809	-.2807	.0419	-.0021	.0071
1.7530	-.1123	.3268	.0445	-.0029	.0083	1.7590	-.0817	-.2841	.0447	-.0021	.0072
1.8625	-.1126	.3277	.0473	-.0029	.0083	1.8690	-.0815	-.2848	.0475	-.0021	.0072
1.9721	-.1117	.3256	.0501	-.0028	.0083	1.9789	-.0806	-.2829	.0503	-.0020	.0072
2.0817	-.1096	.3205	.0529	-.0028	.0081	2.0889	-.0787	-.2784	.0531	-.0020	.0071
2.1912	-.1063	.3125	.0557	-.0027	.0079	2.1988	-.0760	-.2712	.0558	-.0019	.0069
2.3008	-.1019	.3014	.0584	-.0026	.0077	2.3087	-.0725	-.2614	.0586	-.0018	.0066
2.4103	-.0962	.2872	.0612	-.0024	.0073	2.4187	-.0680	-.2489	.0614	-.0017	.0063
2.5199	-.0894	.2700	.0640	-.0023	.0069	2.5286	-.0628	-.2337	.0642	-.0016	.0059
2.6295	-.0813	.2496	.0668	-.0021	.0063	2.6386	-.0567	-.2158	.0670	-.0014	.0055
2.7390	-.0721	.2259	.0696	-.0018	.0057	2.7485	-.0497	-.1951	.0698	-.0013	.0050
2.8486	-.0616	.1990	.0724	-.0016	.0051	2.8584	-.0419	-.1716	.0726	-.0011	.0044
2.9582	-.0498	.1686	.0751	-.0013	.0043	2.9684	-.0333	-.1452	.0754	-.0008	.0037
3.0677	-.0369	.1347	.0779	-.0009	.0034	3.0783	-.0239	-.1159	.0782	-.0006	.0029
3.1773	-.0226	.0971	.0807	-.0006	.0025	3.1883	-.0137	-.0836	.0810	-.0003	.0021
3.2868	-.0071	.0555	.0835	-.0002	.0014	3.2982	-.0026	-.0481	.0838	-.0001	.0012
3.3860	-.0079	.0147	.0860	-.0002	.0004	3.3981	-.0080	-.0133	.0863	-.0002	.0003
3.3964	-.0095	.0105	.0863	-.0002	.0003	3.4082	-.0091	-.0098	.0866	-.0002	.0002

	English Units			SI Units			English Units			SI Units	
RADIUS	(INCHES) = 10.381		RADIUS	(METERS) = .2789		RADIUS	(INCHES) = 11.481		RADIUS	(METERS) = .2916	
CHORD	(INCHES) = 3.396		CHORD	(METERS) = .0863		CHORD	(INCHES) = 3.408		CHORD	(METERS) = .0866	
ZCSL	(INCHES) = 1.7556		ZCSL	(METERS) = .0446		ZCSL	(INCHES) = 1.7686		ZCSL	(METERS) = .0448	
YCSL	(INCHES) = -.1628		YCSL	(METERS) = -.0041		YCSL	(INCHES) = -.1327		YCSL	(METERS) = -.0034	
LER	(INCHES) = .0104		LER	(METERS) = .00026		LER	(INCHES) = .0101		LER	(METERS) = .000257	
TER	(INCHES) = .0108		TER	(METERS) = .000274		TER	(INCHES) = .0104		TER	(METERS) = .000264	
X-AREA	(SQ. IN.) = .5040		X-AREA(SQ.METERS) = .000325			X-AREA	(SQ. IN.) = .4757		X-AREA(SQ.METERS) = .000307		
GAMMA-CHORD(DEG.) = 37.01			GAMMA-CHORD(RAD.) = .6459			GAMMA-CHORD(DEG.) = 40.16			GAMMA-CHORD(RAD.) = .7009		

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

First station

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0089	-.0092	.0000	-.0002	.0002
.0096	-.0083	-.0113	.0002	-.0002	.0003
.1102	-.0019	.0334	.0028	-.0000	.0018
.2205	-.0048	.0567	.0056	.0001	.0014
.3308	-.0111	.0786	.0084	.0003	.0020
.4410	-.0169	.0992	.0112	.0004	.0025
.5513	-.0229	.1186	.0140	.0006	.0030
.6615	-.0274	.1367	.0168	.0007	.0035
.7718	-.0320	.1535	.0196	.0008	.0039
.8820	-.0363	.1690	.0224	.0009	.0043
.9923	-.0401	.1833	.0252	.0010	.0047
1.1025	-.0435	.1964	.0280	.0011	.0050
1.2128	-.0465	.2082	.0308	.0012	.0053
1.3230	-.0491	.2187	.0336	.0012	.0056
1.4333	-.0513	.2282	.0364	.0013	.0058
1.5435	-.0531	.2360	.0392	.0013	.0060
1.6538	-.0543	.2417	.0420	.0014	.0060
1.7640	-.0543	.2452	.0448	.0014	.0061
1.8743	-.0548	.2462	.0476	.0014	.0062
1.9846	-.0541	.2449	.0504	.0014	.0063
2.0948	-.0528	.2412	.0532	.0013	.0062
2.2051	-.0508	.2351	.0560	.0013	.0061
2.3153	-.0483	.2267	.0588	.0012	.0060
2.4256	-.0451	.2159	.0616	.0011	.0058
2.5358	-.0413	.2027	.0644	.0010	.0055
2.6461	-.0370	.1871	.0672	.0009	.0051
2.7563	-.0320	.1691	.0700	.0008	.0043
2.8666	-.0266	.1487	.0728	.0007	.0038
2.9768	-.0205	.1258	.0756	.0005	.0032
3.0871	-.0139	.1004	.0784	.0004	.0026
3.1973	-.0069	.0725	.0812	.0002	.0018
3.3076	-.0008	.0419	.0840	-.0000	.0011
3.4082	-.0079	.0120	.0866	-.0002	.0003
3.4178	-.0086	.0092	.0868	-.0002	.0002

RADIUS (INCHES) = 11.980	RADIUS (METERS) = .3043
CHORD (INCHES) = 3.418	CHORD (METERS) = .0868
ZCSL (INCHES) = 1.7727	ZCSL (METERS) = .0450
YCSL (INCHES) = -.1052	YCSL (METERS) = -.0027
LER (INCHES) = -.0097	LER (METERS) = -.000246
TER (INCHES) = .0098	TER (METERS) = .000249
X-AREA (SQ. IN.) = .4476	X-AREA(SQ.METERS) = .000289
GAMMA-CHORD(DEG.) = 43.16	GAMMA-CHORD(RAD.) = .7532

Second station

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0085	.0088	.0000	-.0002	.0002
.0092	-.0081	.0105	.0002	-.0002	.0003
.1105	-.0036	.0295	.0028	-.0001	.0007
.2209	-.0010	.0494	.0056	.0000	.0013
.3314	-.0053	.0682	.0084	.0001	.0017
.4419	-.0092	.0858	.0112	.0002	.0022
.5524	-.0128	.1024	.0140	.0003	.0026
.6628	-.0161	.1178	.0168	.0004	.0030
.7733	-.0190	.1322	.0196	.0005	.0034
.8838	-.0217	.1454	.0224	.0006	.0037
.9943	-.0241	.1576	.0253	.0007	.0040
1.1047	-.0261	.1687	.0281	.0007	.0043
1.2152	-.0279	.1787	.0309	.0007	.0045
1.3257	-.0294	.1877	.0337	.0008	.0048
1.4361	-.0307	.1958	.0365	.0008	.0050
1.5466	-.0316	.2026	.0393	.0008	.0051
1.6571	-.0322	.2078	.0421	.0008	.0053
1.7676	-.0324	.2110	.0449	.0008	.0054
1.8780	-.0322	.2121	.0477	.0008	.0054
1.9885	-.0317	.2111	.0505	.0008	.0054
2.0990	-.0308	.2081	.0533	.0008	.0053
2.2095	-.0294	.2030	.0561	.0007	.0052
2.3199	-.0278	.1958	.0589	.0007	.0050
2.4304	-.0257	.1866	.0617	.0007	.0047
2.5409	-.0232	.1752	.0645	.0006	.0045
2.6513	-.0204	.1618	.0673	.0005	.0041
2.7618	-.0173	.1463	.0702	.0004	.0037
2.8723	-.0138	.1287	.0730	.0003	.0033
2.9828	-.0100	.1090	.0758	.0003	.0028
3.0932	-.0058	.0872	.0786	.0001	.0022
3.2037	-.0014	.0632	.0814	.0000	.0016
3.3142	-.0033	.0369	.0842	-.0001	.0009
3.4155	-.0079	.0111	.0868	-.0002	.0003
3.4247	-.0083	.0087	.0870	-.0002	.0002

RADIUS (INCHES) = 12.479	RADIUS (METERS) = .3170
CHORD (INCHES) = 3.425	CHORD (METERS) = .0870
ZCSL (INCHES) = 1.7791	ZCSL (METERS) = .0452
YCSL (INCHES) = -.0819	YCSL (METERS) = -.0021
LER (INCHES) = -.0092	LER (METERS) = -.000234
TER (INCHES) = .0093	TER (METERS) = .000236
X-AREA (SQ. IN.) = .4204	X-AREA(SQ.METERS) = .000271
GAMMA-CHORD(DEG.) = 45.11	GAMMA-CHORD(RAD.) = .7873

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0079	.0080	.0000	-.0002	.0002
.0084	-.0076	.0093	.0002	-.0002	.0002
.1108	-.0044	.0260	.0028	-.0001	.0007
.2217	-.0011	.0431	.0056	-.0000	.0011
.3325	.0019	.0592	.0084	.0001	.0015
.4434	.0045	.0743	.0113	.0001	.0019
.5542	.0069	.0885	.0141	.0002	.0022
.6650	.0090	.1016	.0169	.0002	.0026
.7759	.0108	.1137	.0197	.0003	.0029
.8867	.0123	.1248	.0225	.0003	.0032
.9975	.0136	.1350	.0253	.0003	.0034
1.1084	.0146	.1442	.0282	.0004	.0037
1.2192	.0153	.1525	.0310	.0004	.0039
1.3301	.0157	.1597	.0338	.0004	.0041
1.4409	.0159	.1661	.0366	.0004	.0042
1.5517	.0159	.1716	.0394	.0004	.0044
1.6626	.0156	.1759	.0422	.0004	.0045
1.7734	.0151	.1786	.0450	.0004	.0045
1.8843	.0144	.1796	.0479	.0004	.0046
1.9951	.0136	.1787	.0507	.0003	.0045
2.1059	.0126	.1761	.0535	.0003	.0045
2.2168	.0114	.1717	.0563	.0003	.0044
2.3276	.0101	.1656	.0591	.0003	.0042
2.4385	.0086	.1577	.0619	.0002	.0040
2.5493	.0071	.1481	.0648	.0002	.0038
2.6601	.0054	.1367	.0676	.0001	.0035
2.7710	.0037	.1235	.0704	.0001	.0031
2.8818	.0019	.1086	.0732	.0000	.0028
2.9927	.0000	.0920	.0760	.0000	.0023
3.1035	-.0019	.0736	.0788	-.0000	.0019
3.2143	-.0038	.0534	.0816	-.0001	.0014
3.3252	-.0057	.0314	.0845	-.0001	.0008
3.4276	-.0074	.0097	.0871	-.0002	.0002
3.4360	-.0076	.0079	.0873	-.0002	.0002

RADIUS (INCHES)	=	13.172	RADIUS	(METERS)	=	.3346
CHORD (INCHES)	=	3.436	CHORD	(METERS)	=	.0873
ZCSL (INCHES)	=	1.7901	ZCSL	(METERS)	=	.0455
YCSL (INCHES)	=	-.0606	YCSL	(METERS)	=	-.0015
LER (INCHES)	=	.0084	LER (METERS)		=	.000213
TER (INCHES)	=	-.0085	TER (METERS)		=	-.000216
X-AREA (SQ. IN.)	=	.3872	X-AREA(SQ.METERS)		=	.000250
GAMMA-CHORD(DEG.)	=	47.56	GAMMA-CHORD(RAD.)		=	.8301

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0080	.0081	.0000	-.0002	.0002
.0085	-.0077	.0093	.0002	-.0002	.0002
.1109	-.0048	.0247	.0028	-.0001	.0006
.2218	-.0020	.0407	.0056	-.0001	.0010
.3326	.0006	.0559	.0084	.0000	.0014
.4435	.0029	.0701	.0113	.0001	.0018
.5544	.0050	.0834	.0141	.0001	.0021
.6653	.0068	.0959	.0169	.0002	.0024
.7761	.0083	.1074	.0197	.0002	.0027
.8870	.0095	.1180	.0225	.0002	.0030
.9979	.0106	.1277	.0253	.0003	.0032
1.1088	.0114	.1365	.0282	.0003	.0035
1.2197	.0119	.1445	.0310	.0003	.0037
1.3305	.0123	.1515	.0338	.0003	.0038
1.4414	.0124	.1577	.0366	.0003	.0040
1.5523	.0123	.1631	.0394	.0003	.0041
1.6632	.0120	.1675	.0422	.0003	.0043
1.7741	.0116	.1703	.0451	.0003	.0043
1.8849	.0110	.1714	.0479	.0003	.0044
1.9958	.0102	.1707	.0507	.0003	.0043
2.1067	.0093	.1684	.0535	.0002	.0043
2.2176	.0083	.1642	.0563	.0002	.0042
2.3284	.0071	.1584	.0591	.0002	.0040
2.4393	.0059	.1509	.0620	.0001	.0038
2.5502	.0045	.1417	.0648	.0001	.0036
2.6611	.0032	.1308	.0676	.0001	.0033
2.7720	.0017	.1182	.0704	.0000	.0030
2.8828	.0002	.1040	.0732	.0000	.0026
2.9937	-.0013	.0881	.0760	-.0000	.0022
3.1046	-.0029	.0705	.0799	-.0001	.0018
3.2155	-.0044	.0512	.0817	-.0001	.0013
3.3264	-.0060	.0303	.0845	-.0002	.0008
3.4288	-.0075	.0096	.0871	-.0002	.0002
3.4372	-.0076	.0079	.0873	-.0002	.0002

RADIUS (INCHES)	=	13.363	RADIUS	(METERS)	=	.3394
CHORD (INCHES)	=	3.437	CHORD	(METERS)	=	.0873
ZCSL (INCHES)	=	1.7931	ZCSL	(METERS)	=	.0455
YCSL (INCHES)	=	-.0553	YCSL	(METERS)	=	-.0014
LER (INCHES)	=	.0085	LER (METERS)		=	.000216
TER (INCHES)	=	-.0085	TER (METERS)		=	-.000216
X-AREA (SQ. IN.)	=	.3755	X-AREA(SQ.METERS)		=	.000242
GAMMA-CHORD(DEG.)	=	48.49	GAMMA-CHORD(RAD.)		=	.8464

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

First column group

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0081	.0082	.0000	-.0002	.0002
.0085	-.0078	.0093	.0002	-.0002	.0002
.1109	-.0051	.0226	.0028	-.0001	.0006
.2218	-.0024	.0364	.0056	-.0001	.0009
.3328	.0001	.0497	.0085	.0000	.0013
.4437	.0023	.0622	.0113	.0001	.0016
.5546	.0044	.0740	.0141	.0001	.0019
.6656	.0062	.0851	.0169	.0002	.0022
.7765	.0079	.0955	.0197	.0002	.0024
.8874	.0093	.1052	.0225	.0002	.0027
.9983	.0105	.1141	.0254	.0003	.0029
1.1093	.0115	.1223	.0282	.0003	.0031
1.2202	.0124	.1297	.0310	.0003	.0033
1.3311	.0131	.1364	.0338	.0003	.0035
1.4420	.0137	.1424	.0366	.0003	.0036
1.5530	.0141	.1478	.0394	.0004	.0038
1.6639	.0145	.1522	.0423	.0004	.0039
1.7748	.0146	.1553	.0451	.0004	.0039
1.8857	.0145	.1568	.0479	.0004	.0040
1.9967	.0140	.1566	.0507	.0004	.0040
2.1076	.0137	.1547	.0535	.0003	.0039
2.2185	.0126	.1511	.0564	.0003	.0038
2.3294	.0115	.1459	.0592	.0003	.0037
2.4404	.0103	.1391	.0620	.0003	.0035
2.5513	.0089	.1308	.0648	.0002	.0033
2.6622	.0073	.1208	.0676	.0002	.0031
2.7732	.0056	.1093	.0704	.0001	.0028
2.8841	.0038	.0962	.0733	.0001	.0024
2.9950	.0017	.0816	.0761	.0000	.0021
3.1059	-.0004	.0654	.0789	-.0000	.0017
3.2169	-.0027	.0478	.0817	-.0001	.0012
3.3278	-.0052	.0286	.0845	-.0001	.0007
3.4302	-.0076	.0097	.0871	-.0002	.0002
3.4387	-.0078	.0081	.0873	-.0002	.0002

RADIUS (INCHES) = 13.553	RADIUS (METERS) = .3442
CHORD (INCHES) = 3.439	CHORD (METERS) = .0873
ZCSL (INCHES) = 1.7947	ZCSL (METERS) = .0456
YCSL (INCHES) = -.0497	YCSL (METERS) = -.0013
LER (INCHES) = -.0085	LER (METERS) = -.000216
TER (INCHES) = -.0086	TER (METERS) = -.000218
X-AREA (SQ. IN.) = .3343	X-AREA(SQ.METERS)= .000216
GAMMA-CHORD(DEG.)= 49.71	GAMMA-CHORD(RAD.)= .8677

Second column group

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0078	.0078	.0000	-.0002	.0002
.0081	-.0076	.0087	.0002	-.0002	.0002
.1110	-.0056	.0200	.0028	-.0001	.0005
.2220	-.0034	.0318	.0056	-.0001	.0008
.3331	-.0014	.0431	.0085	-.0000	.0011
.4441	-.0005	.0538	.0113	-.0000	.0014
.5551	.0024	.0641	.0141	.0001	.0016
.6661	.0042	.0738	.0169	.0001	.0019
.7771	.0058	.0829	.0197	.0001	.0021
.8882	.0074	.0916	.0226	.0002	.0023
.9992	.0090	.0996	.0254	.0002	.0025
1.1102	.0104	.1071	.0282	.0003	.0027
1.2212	.0118	.1141	.0310	.0003	.0029
1.3323	.0131	.1205	.0338	.0003	.0031
1.4433	.0145	.1263	.0367	.0004	.0032
1.5543	.0158	.1319	.0395	.0004	.0033
1.6653	.0171	.1366	.0423	.0004	.0035
1.7763	.0182	.1403	.0451	.0005	.0036
1.8874	.0189	.1424	.0479	.0005	.0036
1.9984	.0192	.1429	.0508	.0005	.0036
2.1094	.0191	.1418	.0536	.0005	.0036
2.2204	.0186	.1391	.0564	.0005	.0035
2.3315	.0178	.1348	.0592	.0005	.0034
2.4425	.0167	.1290	.0620	.0004	.0033
2.5535	.0153	.1216	.0649	.0004	.0031
2.6645	.0135	.1127	.0677	.0003	.0029
2.7755	.0114	.1022	.0705	.0003	.0026
2.8866	.0090	.0902	.0733	.0002	.0023
2.9976	.0063	.0767	.0761	.0002	.0019
3.1086	.0033	.0617	.0790	.0001	.0016
3.2196	-.0001	.0452	.0818	-.0000	.0011
3.3307	-.0037	.0272	.0846	-.0001	.0007
3.4335	-.0073	.0093	.0872	-.0002	.0002
3.4417	-.0076	.0079	.0874	-.0002	.0002

RADIUS (INCHES) = 13.785	RADIUS (METERS) = .3491
CHORD (INCHES) = 3.442	CHORD (METERS) = .0874
ZCSL (INCHES) = 1.7942	ZCSL (METERS) = .0456
YCSL (INCHES) = -.0484	YCSL (METERS) = -.0011
LER (INCHES) = -.0082	LER (METERS) = -.000208
TER (INCHES) = -.0082	TER (METERS) = -.000208
X-AREA (SQ. IN.) = .2930	X-AREA(SQ.METERS)= .000189
GAMMA-CHORD(DEG.)= 50.86	GAMMA-CHORD(RAD.)= .8876

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0077	.0078	.0000	-.0002	.0002
.0080	-.0076	.0085	.0002	-.0002	.0002
.1111	-.0064	.0183	.0028	-.0002	.0005
.2222	-.0051	.0286	.0056	-.0001	.0007
.3333	-.0038	.0384	.0085	-.0001	.0010
.4445	-.0024	.0479	.0113	-.0001	.0012
.5556	-.0009	.0571	.0141	-.0000	.0014
.6667	-.0006	.0658	.0159	-.0000	.0017
.7778	-.0021	.0741	.0198	.0001	.0019
.8889	-.0037	.0820	.0226	-.0001	.0021
1.0000	-.0053	.0896	.0254	-.0001	.0023
1.1111	-.0070	.0967	.0282	-.0002	.0025
1.2222	-.0088	.1035	.0310	-.0002	.0026
1.3334	-.0106	.1099	.0339	-.0003	.0028
1.4445	-.0125	.1159	.0367	-.0003	.0029
1.5556	-.0146	.1217	.0395	-.0004	.0031
1.6667	-.0168	.1270	.0423	-.0004	.0032
1.7778	-.0187	.1318	.0452	-.0005	.0033
1.8889	-.0203	.1344	.0480	-.0005	.0034
2.0000	-.0213	.1357	.0508	-.0005	.0034
2.1112	-.0218	.1353	.0536	-.0006	.0034
2.2223	-.0218	.1334	.0564	-.0006	.0034
2.3334	-.0214	.1299	.0593	-.0005	.0033
2.4445	-.0204	.1247	.0621	-.0005	.0032
2.5556	-.0191	.1180	.0649	-.0005	.0030
2.6667	-.0172	.1097	.0677	-.0004	.0028
2.7778	-.0150	.0998	.0706	-.0004	.0025
2.8890	-.0123	.0884	.0734	-.0003	.0022
3.0001	-.0092	.0758	.0762	-.0002	.0019
3.1112	-.0056	.0608	.0790	-.0001	.0015
3.2223	-.0016	.0446	.0818	-.0000	.0011
3.3334	-.0028	.0269	.0847	-.0001	.0007
3.4365	-.0071	.0091	.0873	-.0002	.0002
3.4445	-.0075	.0077	.0875	-.0002	.0002

RADIUS (INCHES) = 13.977	RADIUS (METERS) = .3550
CHORD (INCHES) = 3.444	CHORD (METERS) = .0875
ZCSL (INCHES) = 1.7949	ZCSL (METERS) = .0456
YCSL (INCHES) = .0402	YCSL (METERS) = .0010
LER (INCHES) = .0081	LER (METERS) = .000206
TER (INCHES) = .0081	TER (METERS) = .000206
X-AREA (SQ. IN.) = .2730	X-AREA (SQ. METERS) = .000176
GAMMA-CHORD(DEG.) = 52.03	GAMMA-CHORD(RAD.) = .9080

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0074	.0074	.0000	-.0002	.0002
.0077	-.0074	.0080	.0002	-.0002	.0002
.1113	-.0075	.0158	.0028	-.0002	.0004
.2225	-.0075	.0239	.0057	-.0002	.0006
.3338	-.0073	.0319	.0085	-.0002	.0008
.4451	-.0070	.0396	.0113	-.0002	.0010
.5564	-.0064	.0471	.0141	-.0002	.0012
.6676	-.0057	.0544	.0170	-.0001	.0014
.7789	-.0047	.0615	.0198	-.0001	.0016
.8902	-.0036	.0683	.0226	-.0001	.0017
1.0015	-.0023	.0750	.0254	-.0001	.0019
1.1127	-.0003	.0814	.0283	-.0000	.0021
1.2240	-.0003	.0877	.0311	-.0000	.0022
1.3353	.0027	.0937	.0339	.0001	.0024
1.4465	.0048	.0995	.0367	.0001	.0025
1.5578	.0072	.1053	.0396	.0002	.0027
1.6691	.0099	.1107	.0424	.0003	.0028
1.7904	.0125	.1158	.0452	.0003	.0029
1.8916	.0148	.1195	.0480	.0004	.0030
2.0029	.0165	.1216	.0509	.0004	.0031
2.1142	.0177	.1222	.0537	.0004	.0031
2.2255	.0183	.1211	.0565	.0005	.0031
2.3367	.0184	.1185	.0594	.0005	.0030
2.4480	.0180	.1143	.0622	.0005	.0029
2.5593	.0171	.1085	.0650	.0004	.0028
2.6706	.0157	.1012	.0678	.0004	.0026
2.7818	.0138	.0924	.0707	.0003	.0023
2.8931	.0114	.0820	.0735	.0003	.0021
3.0044	.0085	.0701	.0763	.0002	.0018
3.1156	.0053	.0567	.0791	.0001	.0014
3.2269	.0015	.0417	.0820	.0000	.0011
3.3382	-.0026	.0252	.0848	-.0001	.0006
3.4418	-.0069	.0086	.0874	-.0002	.0002
3.4495	-.0072	.0074	.0876	-.0002	.0002

RADIUS (INCHES) = 14.376	RADIUS (METERS) = .3652
CHORD (INCHES) = 3.449	CHORD (METERS) = .0875
ZCSL (INCHES) = 1.7987	ZCSL (METERS) = .0457
YCSL (INCHES) = -.0307	YCSL (METERS) = .0008
LER (INCHES) = .0077	LER (METERS) = .000196
TER (INCHES) = .0077	TER (METERS) = .000196
X-AREA (SQ. IN.) = .2521	X-AREA (SQ. METERS) = .000163
GAMMA-CHORD(DEG.) = 53.79	GAMMA-CHORD(RAD.) = .9389

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

(First station)

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0071	.0074	.0000	-.0002	.0002
.0075	-.0072	.0078	.0002	-.0002	.0002
.1115	-.0088	.0142	.0028	-.0002	.0004
.2230	-.0103	.0208	.0057	-.0003	.0005
.3345	-.0115	.0271	.0085	-.0003	.0007
.4460	-.0124	.0334	.0113	-.0003	.0008
.5575	-.0130	.0396	.0142	-.0003	.0010
.6690	-.0133	.0459	.0170	-.0003	.0012
.7805	-.0133	.0520	.0198	-.0003	.0013
.8920	-.0130	.0581	.0227	-.0003	.0015
1.0035	-.0124	.0639	.0255	-.0003	.0016
1.1150	-.0115	.0696	.0283	-.0003	.0018
1.2265	-.0103	.0752	.0312	-.0003	.0019
1.3380	-.0088	.0807	.0340	-.0002	.0021
1.4495	-.0069	.0863	.0368	-.0002	.0022
1.5610	-.0047	.0919	.0396	-.0001	.0023
1.6725	-.0021	.0973	.0425	-.0001	.0025
1.7840	-.0008	.1025	.0453	.0000	.0026
1.8955	.0036	.1067	.0481	.0001	.0027
2.0070	.0059	.1096	.0510	.0001	.0028
2.1185	.0077	.1110	.0538	.0002	.0028
2.2300	.0090	.1108	.0566	.0002	.0028
2.3415	.0038	.1091	.0595	.0002	.0028
2.4530	.0102	.1058	.0623	.0003	.0027
2.5645	.0100	.1010	.0651	.0003	.0026
2.6760	.0094	.0946	.0680	.0002	.0024
2.7875	.0084	.0867	.0708	.0002	.0022
2.8990	.0069	.0772	.0736	.0002	.0020
3.0105	.0050	.0662	.0765	.0001	.0017
3.1220	.0027	.0537	.0793	.0001	.0014
3.2335	-.0000	.0396	.0821	-.0001	.0010
3.3450	-.0032	.0240	.0850	-.0001	.0006
3.4493	-.0064	.0080	.0876	-.0002	.0002
3.4565	-.0067	.0069	.0878	-.0002	.0002

RADIUS (INCHES) = 14.976	RADIUS (METERS) = .3804
CHORD (INCHES) = 3.456	CHORD (METERS) = .0878
ZCSL (INCHES) = 1.8030	ZCSL (METERS) = .0458
YCSL (INCHES) = .0199	YCSL (METERS) = .0005
LER (INCHES) = .0075	LER (METERS) = .000190
TER (INCHES) = .0072	TER (METERS) = .000183
X-AREA (SQ. IN.) = .2495	X-AREA(SQ.METERS) = .000161
GAMMA-CHORD(DEG.) = 55.87	GAMMA-CHORD(RAD.) = .9750

(Second station)

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0069	.0069	.0000	-.0002	.0002
.0072	-.0071	.0072	.0002	-.0002	.0002
.1117	-.0101	.0121	.0028	-.0003	.0003
.2234	-.0130	.0173	.0057	-.0003	.0004
.3351	-.0155	.0225	.0085	-.0004	.0006
.4468	-.0176	.0277	.0113	-.0004	.0007
.5585	-.0192	.0330	.0142	-.0005	.0008
.6702	-.0204	.0383	.0170	-.0005	.0010
.7819	-.0212	.0436	.0199	-.0005	.0011
.8936	-.0215	.0490	.0227	-.0005	.0012
1.0052	-.0215	.0543	.0255	-.0005	.0014
1.1169	-.0210	.0596	.0284	-.0005	.0015
1.2286	-.0200	.0650	.0312	-.0005	.0017
1.3403	-.0187	.0704	.0340	-.0005	.0018
1.4520	-.0169	.0759	.0369	-.0004	.0019
1.5637	-.0146	.0814	.0397	-.0004	.0021
1.6754	-.0118	.0871	.0426	-.0003	.0022
1.7871	-.0085	.0929	.0454	-.0002	.0024
1.8988	-.0051	.0980	.0482	-.0001	.0025
2.0105	-.0020	.1019	.0511	-.0001	.0026
2.1222	-.0005	.1042	.0539	-.0000	.0026
2.2339	.0026	.1049	.0567	-.0001	.0027
2.3456	.0041	.1040	.0596	-.0001	.0026
2.4573	.0052	.1015	.0624	-.0001	.0026
2.5690	.0058	.0974	.0653	-.0001	.0025
2.6807	.0059	.0917	.0681	-.0001	.0023
2.7924	.0055	.0844	.0709	-.0001	.0021
2.9041	.0047	.0755	.0738	-.0001	.0019
3.0158	.0034	.0649	.0766	-.0001	.0016
3.1274	.0016	.0528	.0794	-.0000	.0013
3.2391	-.0007	.0390	.0823	-.0000	.0010
3.3508	-.0034	.0236	.0851	-.0001	.0006
3.4556	-.0063	.0077	.0878	-.0002	.0002
3.4625	-.0065	.0067	.0879	-.0002	.0002

RADIUS (INCHES) = 15.475	RADIUS (METERS) = .3931
CHORD (INCHES) = 3.463	CHORD (METERS) = .0880
ZCSL (INCHES) = 1.8107	ZCSL (METERS) = .0460
YCSL (INCHES) = .0120	YCSL (METERS) = .0003
LER (INCHES) = .0072	LER (METERS) = .000183
TER (INCHES) = .0070	TER (METERS) = .000178
X-AREA (SQ. IN.) = .2495	X-AREA(SQ.METERS) = .000161
GAMMA-CHORD(DEG.) = 57.57	GAMMA-CHORD(RAD.) = 1.0048

TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES — ROTOR 2

First Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0000	-.0067	.0067	.0000	-.0002	.0002
-.0070	-.0070	.0069	.0002	-.0002	.0002
.1120	-.0110	.0111	.0028	-.0003	.0003
.2239	-.0146	.0155	.0057	-.0004	.0004
.3359	-.0177	.0202	.0085	-.0004	.0005
.4478	-.0201	.0249	.0114	-.0005	.0006
.5598	-.0221	.0298	.0142	-.0006	.0008
.6718	-.0235	.0349	.0171	-.0006	.0009
.7837	-.0243	.0401	.0199	-.0006	.0010
.8957	-.0246	.0456	.0228	-.0006	.0012
1.0076	-.0242	.0512	.0256	-.0006	.0013
1.1196	-.0233	.0570	.0284	-.0006	.0014
1.2315	-.0218	.0629	.0313	-.0006	.0016
1.3435	-.0196	.0691	.0341	-.0005	.0018
1.4555	-.0169	.0754	.0370	-.0004	.0019
1.5674	-.0137	.0820	.0398	-.0003	.0021
1.6794	-.0096	.0889	.0427	-.0002	.0023
1.7913	-.0049	.0962	.0455	-.0001	.0024
1.9033	-.0002	.1032	.0483	.0000	.0026
2.0153	.0052	.1092	.0512	.0001	.0028
2.1272	.0094	.1135	.0540	.0002	.0029
2.2392	.0128	.1157	.0569	.0003	.0029
2.3511	.0154	.1160	.0597	.0004	.0029
2.4631	.0171	.1143	.0626	.0004	.0029
2.5751	.0180	.1107	.0654	.0005	.0028
2.6870	.0187	.1049	.0683	.0005	.0027
2.7990	.0171	.0972	.0711	.0004	.0025
2.9109	.0157	.0875	.0739	.0004	.0022
3.0229	.0132	.0757	.0768	.0003	.0019
3.1349	.0098	.0617	.0796	.0002	.0016
3.2468	.0053	.0456	.0825	.0001	.0012
3.3588	-.0011	.0271	.0853	-.0000	.0007
3.4638	-.0061	.0080	.0880	-.0002	.0002
3.4707	-.0065	.0068	.0882	-.0002	.0002

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) =	16.175	RADIUS (METERS) =	.4109
CHORD (INCHES) =	3.471	CHORD (METERS) =	.0882
ZCSL (INCHES) =	1.8195	ZCSL (METERS) =	.0462
YCSL (INCHES) =	.0145	YCSL (METERS) =	.0004
LER (INCHES) =	.0070	LER (METERS) =	.000178
TER (INCHES) =	.0070	TER (METERS) =	.000178
X-AREA (SQ. IN.) =	.2505	X-AREA (SQ. METERS) =	.000162
GAMMA-CHORD(DEG.) =	59.30	GAMMA-CHORD(RAD.) =	1.0351

Second Section

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0068	.0067	.0000	-.0002	.0002
.0070	-.0070	.0070	.0002	-.0002	.0002
.1120	-.0103	.0117	.0028	-.0003	.0003
.2241	-.0132	.0169	.0057	-.0003	.0004
.3361	-.0156	.0222	.0085	-.0004	.0006
.4482	-.0174	.0277	.0114	-.0004	.0007
.5602	-.0196	.0334	.0142	-.0005	.0008
.6722	-.0132	.0393	.0171	-.0005	.0010
.7843	-.0192	.0453	.0199	-.0005	.0012
.8963	-.0186	.0516	.0228	-.0005	.0013
1.0083	-.0174	.0580	.0256	-.0005	.0015
1.1204	-.0156	.0647	.0285	-.0004	.0016
1.2324	-.0132	.0715	.0313	-.0003	.0018
1.3445	-.0101	.0786	.0341	-.0003	.0020
1.4565	-.0064	.0860	.0370	-.0002	.0022
1.5685	-.0021	.0935	.0398	-.0001	.0024
1.6806	.0028	.1014	.0427	.0001	.0026
1.7926	.0087	.1098	.0455	.0002	.0028
1.9047	.0149	.1180	.0484	.0004	.0030
2.0167	.0210	.1251	.0512	.0005	.0032
2.1287	.0260	.1303	.0541	.0007	.0033
2.2408	.0300	.1331	.0569	.0008	.0034
2.3528	.0328	.1337	.0598	.0008	.0034
2.4649	.0344	.1319	.0626	.0009	.0034
2.5769	.0349	.1278	.0655	.0009	.0032
2.6889	.0341	.1213	.0683	.0009	.0031
2.8010	.0322	.1125	.0711	.0008	.0029
2.9130	.0290	.1012	.0740	.0007	.0026
3.0251	.0245	.0874	.0768	.0006	.0022
3.1371	.0188	.0712	.0797	.0005	.0018
3.2491	.0117	.0523	.0825	.0003	.0013
3.3612	.0033	.0308	.0854	.0001	.0008
3.4663	-.0059	.0083	.0880	-.0001	.0002
3.4732	-.0065	.0068	.0882	-.0002	.0002

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) =	16.425	RADIUS (METERS) =	.4172
CHORD (INCHES) =	3.473	CHORD (METERS) =	.0882
ZCSL (INCHES) =	1.8221	ZCSL (METERS) =	.0463
YCSL (INCHES) =	-.0252	YCSL (METERS) =	-.0006
LER (INCHES) =	.0070	LER (METERS) =	.000178
TER (INCHES) =	.0070	TER (METERS) =	.000178
X-AREA (SQ. IN.) =	.2513	X-AREA (SQ. METERS) =	.000162
GAMMA-CHORD(DEG.) =	59.55	GAMMA-CHORD(RAD.) =	1.0392

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TABLE XXVI (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – ROTOR 2

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0000	-.0069	.0067	.0000	-.0002	.0002
.0071	-.0071	.0071	.0002	-.0002	.0002
.1121	-.0100	.0121	.0029	-.0003	.0003
.2241	-.0126	.0176	.0057	-.0003	.0004
.3362	-.0147	.0232	.0085	-.0004	.0006
.4483	-.0161	.0291	.0114	-.0004	.0007
.5604	-.0169	.0352	.0142	-.0004	.0009
.6724	-.0171	.0414	.0171	-.0004	.0011
.7845	-.0166	.0479	.0199	-.0004	.0012
.8966	-.0156	.0546	.0228	-.0004	.0014
1.0086	-.0140	.0615	.0256	-.0004	.0016
1.1207	-.0117	.0686	.0285	-.0003	.0017
1.2328	-.0088	.0759	.0313	-.0002	.0019
1.3449	-.0053	.0835	.0342	-.0001	.0021
1.4569	-.0011	.0913	.0370	-.0000	.0023
1.5690	.0037	.0993	.0399	.0001	.0025
1.6811	.0092	.1078	.0427	.0002	.0027
1.7932	.0156	.1168	.0455	.0004	.0030
1.9052	.0225	.1256	.0484	.0006	.0032
2.0173	.0291	.1333	.0512	.0007	.0034
2.1294	.0347	.1390	.0541	.0009	.0035
2.2414	.0390	.1422	.0569	.0010	.0036
2.3535	.0419	.1430	.0598	.0011	.0036
2.4656	.0435	.1412	.0626	.0011	.0036
2.5777	.0437	.1369	.0655	.0011	.0035
2.6897	.0426	.1300	.0683	.0011	.0033
2.8018	.0401	.1206	.0712	.0010	.0031
2.9139	.0361	.1085	.0740	.0009	.0028
3.0260	.0306	.0938	.0769	.0008	.0024
3.1380	.0237	.0763	.0797	.0006	.0019
3.2501	.0152	.0560	.0826	.0004	.0014
3.3622	.0051	.0328	.0854	.0001	.0008
3.4674	-.0058	.0084	.0881	-.0001	.0002
3.4742	-.0065	.0069	.0882	-.0002	.0002

RADIUS (INCHES) = 16.575		RADIUS (METERS) = .4210
CHORD (INCHES) = 3.474		CHORD (METERS) = .0882
ZCSL (INCHES) = 1.8231		ZCSL (METERS) = .0463
YCSL (INCHES) = -.0308		YCSL (METERS) = -.0008
LER (INCHES) = .0071		LER (METERS) = .000180
TER (INCHES) = .0070		TER (METERS) = .000179
X-AREA (SQ. IN.) = .2517		X-AREA (SQ. METERS) = .000162
GAMMA-CHORD(DEG.) = 59.71		GAMMA-CHORD(RAD.) = 1.0422

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TABLE XXVII

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

First set

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0014	.0041	.0041	-.0000	.0001	.0001
-.0011	-.0011	.0118	-.0000	-.0000	.0003
-.0035	-.0025	.0162	.0001	-.0001	.0004
-.0059	-.0029	.0198	.0001	-.0001	.0005
-.0083	-.0028	.0230	.0002	-.0001	.0006
.0296	.0026	.0461	.0008	.0001	.0012
.0509	.0118	.0656	.0013	.0003	.0017
.0722	.0219	.0835	.0018	.0006	.0021
.0935	.0320	.1011	.0024	.0008	.0026
.1148	.0421	.1174	.0029	.0011	.0030
.2608	.1063	.2107	.0066	.0027	.0054
.4068	.159?	.2797	.0103	.0040	.0071
.5529	.1994	.3299	.0140	.0051	.0084
.6989	.2283	.3629	.0178	.0058	.0092
.8449	.2460	.3800	.0215	.0062	.0097
.9909	.2531	.3817	.0252	.0064	.0057
1.1370	.2499	.3680	.0289	.0063	.0093
1.2830	.2358	.3386	.0326	.0060	.0086
1.4290	.2087	.2940	.0363	.0053	.0075
1.5750	.1673	.2338	.0400	.0043	.0059
1.7210	.1099	.1563	.0437	.0028	.0040
1.8255	.0573	.0895	.0464	.0015	.0023
1.8468	.0454	.0745	.0469	.0012	.0019
1.8681	.0329	.0591	.0474	.0008	.0015
1.8894	.0201	.0431	.0480	.0005	.0011
1.9107	.0067	.0266	.0485	.0002	.0007
1.9257	-.0026	.0147	.0489	-.0001	.0004
1.9281	-.0028	.0127	.0490	-.0001	.0003
1.9305	-.0022	.0108	.0490	-.0001	.0003
1.9329	-.0004	.0086	.0491	-.0000	.0002
1.9345	-.0041	.0041	.0491	-.0001	.0001

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) =	9.043	RADIUS (METERS) =	.2297
CHORD (INCHES) =	1.933	CHORD (METERS) =	.0491
ZCSL (INCHES) =	.8678	ZCSL (METERS) =	.0220
YCSL (INCHES) =	.2454	YCSL (METERS) =	.0062
RLE (INCHES) =	.0070	RLE (METERS) =	.000178
RTE (INCHES) =	.0070	RTE (METERS) =	.000178
X-AREA (SQ. IN.) =	.1867	X-AREA(SG.METERS)=	.000120
GAMMA-CHORD(DEG.)=	23.18	GAMMA-CHORD(RAD.)=	.4047

Second set

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0012	.0039	.0039	-.0000	.0001	.0001
-.0012	-.0014	.0113	-.0000	-.0000	.0003
-.0036	-.0028	.0156	.0001	-.0001	.0004
-.0061	-.0031	.0189	.0002	-.0001	.0005
-.0085	-.0032	.0220	.0002	-.0001	.0006
.0297	.0011	.0436	.0008	.0000	.0011
.0510	.0032	.0618	.0013	.0002	.0016
.0722	.0181	.0788	.0018	.0005	.0020
.0935	.0271	.0949	.0024	.0007	.0024
.1147	.0361	.1101	.0029	.0009	.0028
.2605	.0941	.1974	.0066	.0024	.0050
.4062	.425	.2624	.0103	.0036	.0067
.5519	.1795	.3097	.0140	.0046	.0079
.6976	.2062	.3409	.0177	.0052	.0087
.8434	.2227	.3571	.0214	.0057	.0091
.9891	.2296	.3585	.0251	.0058	.0091
1.1348	.2270	.3452	.0288	.0058	.0088
1.2805	.2143	.3171	.0325	.0054	.0081
1.4262	.1897	.2747	.0362	.0048	.0070
1.5720	.1518	.2179	.0399	.0039	.0055
1.7177	.0994	.1452	.0436	.0025	.0037
1.8219	.0515	.0831	.0463	.0013	.0021
1.8432	.0406	.0692	.0468	.0010	.0018
1.8644	.0294	.0549	.0474	.0007	.0014
1.8857	.0177	.0402	.0479	.0004	.0010
1.9069	.0056	.0250	.0484	.0001	.0006
1.9219	-.0028	.0140	.0488	-.0001	.0004
1.9243	-.0031	.0122	.0489	-.0001	.0003
1.9267	-.0025	.0104	.0489	-.0001	.0003
1.9291	-.0006	.0084	.0490	-.0000	.0002
1.9308	-.0039	.0039	.0490	-.0001	.0001

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) =	9.275	RADIUS (METERS) =	.2356
CHORD (INCHES) =	1.930	CHORD (METERS) =	.0490
ZCSL (INCHES) =	.8668	ZCSL (METERS) =	.0220
YCSL (INCHES) =	.2274	YCSL (METERS) =	.0058
RLE (INCHES) =	.0070	RLE (METERS) =	.000178
RTE (INCHES) =	.0070	RTE (METERS) =	.000178
X-AREA (SQ. IN.) =	.1857	X-AREA(SG.METERS)=	.000120
GAMMA-CHORD(DEG.)=	22.04	GAMMA-CHORD(RAD.)=	.3846

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

English Units (Inches)

ZC	YP	YS
-.0011	-.0037	.0037
.0013	-.0016	.0109
.0038	-.0029	.0150
.0062	-.0034	.0183
.0086	-.0035	.0212
.0298	-.0000	.0418
.0510	.0072	.0590
.0722	.0153	.0751
.0935	.0235	.0903
.1147	.0317	.1047
.2602	.0850	.1876
.4057	.1298	.2494
.5512	.1643	.2946
.6967	.1893	.3243
.8421	.2049	.3397
.9876	.2116	.3409
1.1331	.2094	.3280
1.2786	.1979	.3008
1.4241	.1752	.2602
1.5696	.1402	.2059
1.7151	.0915	.1365
1.8192	.0472	.0783
1.8404	.0371	.0653
1.8616	.0267	.0518
1.8828	.0159	.0380
1.9041	.0048	.0238
1.9190	-.0030	.0135
1.9214	-.0033	.0118
1.9238	-.0026	.0102
1.9262	-.0008	.0082
1.9279	.0037	.0037

RADIUS (INCHES) = 9.462
CHORD (INCHES) = 1.927
ZCSL (INCHES) = .8659
YCSL (INCHES) = .2136
RLE (INCHES) = .0070
RTE (INCHES) = .0070
X-AREA (SQ. IN.) = .1851
GAMMA-CHORD(DEG.) = 21.20

SI Units (Meters)

ZC	YP	YS
-.0000	.0001	.0001
.0000	-.0000	.0003
.0001	-.0001	.0004
.0002	-.0001	.0005
.0002	-.0001	.0005
.0008	.0000	.0011
.0013	.0002	.0015
.0018	.0004	.0019
.0024	.0006	.0023
.0029	.0008	.0027
.0066	.0022	.0048
.0103	.0033	.0063
.0140	.0042	.0075
.0177	.0048	.0082
.0214	.0052	.0086
.0251	.0054	.0087
.0288	.0053	.0083
.0325	.0050	.0076
.0362	.0045	.0066
.0399	.0036	.0052
.0436	.0023	.0035
.0462	.0012	.0020
.0467	.0009	.0017
.0473	.0007	.0013
.0478	.0004	.0010
.0484	.0001	.0006
.0487	-.0001	.0003
.0488	-.0001	.0003
.0489	-.0001	.0003
.0489	-.0000	.0002
.0490	.0001	.0001

RADIUS (METERS) = .2403
CHORD (METERS) = .0489
ZCSL (METERS) = .0220
YCSL (METERS) = .0054
RLE (METERS) = .000178
RTE (METERS) = .000178
X-AREA(SQ.METERS)= .000119
GAMMA-CHORD(RAD.)= .3700

English Units (Inches)

ZC	YP	YS
-.0009	.0035	.0035
.0015	-.0018	.0106
.0039	-.0031	.0146
.0063	-.0036	.0178
.0087	-.0039	.0205
.0299	-.0010	.0402
.0511	.0054	.0565
.0722	.0128	.0719
.0934	.0202	.0863
.1146	.0277	.1000
.2599	.0768	.1789
.4052	.1185	.2379
.5505	.1507	.2810
.6957	.1742	.3094
.8410	.1890	.3240
.9863	.1954	.3251
1.1316	.1937	.3125
1.2769	.1832	.2863
1.4221	.1623	.2472
1.5674	.1297	.1953
1.7127	.0846	.1296
1.8166	.0433	.0741
1.8378	.0340	.0618
1.8590	.0244	.0492
1.8802	.0144	.0361
1.9014	.0041	.0228
1.9163	-.0032	.0131
1.9187	-.0035	.0115
1.9211	-.0028	.0099
1.9235	-.0010	.0080
1.9251	.0035	.0035

RADIUS (INCHES) = 9.650
CHORD (INCHES) = 1.924
ZCSL (INCHES) = .8651
YCSL (INCHES) = .2013
RLE (INCHES) = .0070
RTE (INCHES) = .0070
X-AREA (SQ. IN.) = .1847
GAMMA-CHORD(DEG.) = 20.54

SI Units (Meters)

ZC	YP	YS
-.0000	-.0001	.0001
.0000	-.0000	.0003
.0001	-.0001	.0004
.0002	-.0001	.0005
.0002	-.0001	.0005
.0008	-.0000	.0010
.0013	.0001	.0014
.0018	.0003	.0018
.0024	.0005	.0022
.0029	.0007	.0025
.0066	.0020	.0045
.0103	.0030	.0060
.0140	.0038	.0071
.0177	.0044	.0079
.0214	.0048	.0082
.0251	.0050	.0083
.0287	.0049	.0079
.0324	.0047	.0073
.0361	.0041	.0063
.0398	.0033	.0050
.0435	.0021	.0033
.0461	.0011	.0019
.0467	.0009	.0016
.0472	.0006	.0012
.0478	.0004	.0009
.0483	.0001	.0006
.0487	-.0001	.0003
.0487	-.0001	.0003
.0488	-.0001	.0003
.0489	-.0000	.0002
.0489	.0001	.0001

RADIUS (METERS) = .2451
CHORD (METERS) = .0489
ZCSL (METERS) = .0220
YCSL (METERS) = .0051
RLE (METERS) = .000178
RTE (METERS) = .000178
X-AREA(SQ.METERS)= .000119
GAMMA-CHORD(RAD.)= .3584

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

First group

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0008	-.0033	.0033	-.0000	.0001	.0001
.0016	-.0020	.0101	.0000	-.0001	.0003
.0040	-.0034	.0140	.0001	-.0001	.0004
.0064	-.0039	.0170	.0002	-.0001	.0004
.0088	-.0043	.0196	.0002	-.0001	.0005
.0299	-.024	.0380	.0008	-.0001	.0010
.0511	-.0030	.0532	.0013	-.0001	.0014
.0722	-.0093	.0674	.0018	-.0002	.0017
.0934	-.0158	.0809	.0024	-.0004	.0021
.1145	-.0223	.0936	.0029	-.0006	.0024
.2595	-.0656	.1669	.0066	-.0017	.0042
.4044	-.1028	.2219	.0103	-.0026	.0056
.5494	-.1318	.2621	.0140	-.0033	.0067
.6943	-.1531	.2887	.0176	-.0039	.0073
.8393	-.1667	.3022	.0213	-.0042	.0077
.9843	-.1729	.3030	.0250	-.0044	.0077
1.1292	-.1717	.2909	.0287	-.0044	.0074
1.2742	-.1628	.2660	.0324	-.0041	.0068
1.4191	-.1444	.2292	.0360	-.0037	.0058
1.5641	-.1154	.1806	.0397	-.0029	.0046
1.7090	-.0750	.1196	.0434	-.0019	.0030
1.8127	-.0381	.0684	.0460	-.0010	.0017
1.8339	-.0298	.0571	.0466	-.0008	.0015
1.8550	-.0221	.0455	.0471	-.0005	.0012
1.8761	-.0122	.0336	.0477	-.0003	.0009
1.8973	-.0031	.0213	.0482	-.0001	.0005
1.9122	-.0035	.0125	.0486	-.0001	.0003
1.9146	-.0037	.0111	.0486	-.0001	.0003
1.9170	-.0031	.0096	.0487	-.0001	.0002
1.9194	-.0012	.0078	.0488	-.0000	.0002
1.9210	-.0033	.0033	.0488	-.0001	.0001

English Units		SI Units	
RADIUS (INCHES) = 9.952		RADIUS (METERS) = .2528	
CHORD (INCHES) = 1.920		CHORD (METERS) = .0488	
ZCSL (INCHES) = -.8638		ZCSL (METERS) = .0219	
YCSL (INCHES) = -.1840		YCSL (METERS) = .0047	
RLE (INCHES) = -.0070		RLE (METERS) = .000178	
RTE (INCHES) = -.0070		RTE (METERS) = .000178	
X-AREA (SQ. IN.) = -.1840		X-AREA (SQ.METERS) = .000019	
GAMMA-CHORD (DEG.) = 19.38		GAMMA-CHORD (RAD.) = .3383	

Second group

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0007	.0031	.0031	-.0000	.0001	.0001
.0017	-.0022	.0098	.0000	-.0001	.0003
.0041	-.0035	.0136	.0001	-.0001	.0003
.0065	-.0042	.0166	.0002	-.0001	.0004
.0089	-.0046	.0191	.0002	-.0001	.0005
.0300	-.0032	.0369	.0008	-.0001	.0009
.0511	.0016	.0515	.0013	.0000	.0013
.0722	.0074	.0651	.0018	.0002	.0017
.0933	.0133	.0780	.0024	.0003	.0020
.1144	.0193	.0901	.0029	.0005	.0023
.2592	.0594	.1604	.0066	.0015	.0041
.4039	.0942	.2132	.0103	.0024	.0054
.5487	.1213	.2518	.0139	.0031	.0064
.6934	.1415	.2773	.0176	.0036	.0070
.8382	.1543	.2902	.0213	.0039	.0074
.9829	.1604	.2908	.0250	.0041	.0074
1.1277	.1596	.2790	.0286	.0041	.0071
1.2724	.1515	.2549	.0323	.0038	.0065
1.4172	.1344	.2193	.0360	.0034	.0056
1.5619	.1074	.1725	.0397	.0027	.0044
1.7067	.0697	.1141	.0433	.0018	.0029
1.8102	.0352	.0653	.0460	.0009	.0017
1.8313	.0274	.0546	.0465	.0007	.0014
1.8524	.0194	.0435	.0471	.0005	.0011
1.8735	.0111	.0322	.0476	.0003	.0008
1.8946	.0025	.0206	.0481	.0001	.0005
1.9095	-.0036	.0122	.0485	-.0001	.0003
1.9119	-.0039	.0108	.0486	-.0001	.0003
1.9143	-.0032	.0095	.0486	-.0001	.0002
1.9167	-.0014	.0076	.0487	-.0000	.0002
1.9183	-.0031	.0031	.0487	-.0001	.0001

English Units		SI Units	
RADIUS (INCHES) = 10.161		RADIUS (METERS) = .2581	
CHORD (INCHES) = 1.918		CHORD (METERS) = .0487	
ZCSL (INCHES) = .8629		ZCSL (METERS) = .0219	
YCSL (INCHES) = .1745		YCSL (METERS) = .0044	
RLE (INCHES) = .0070		RLE (METERS) = .000178	
RTE (INCHES) = .0070		RTE (METERS) = .000178	
X-AREA (SQ. IN.) = .1838		X-AREA (SQ.METERS) = .000019	
GAMMA-CHORD (DEG.) = 18.42		GAMMA-CHORD (RAD.) = .3215	

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

English Units (Inches) ZC	YP	YS	SI Units (Meters) ZC	YP	YS
-.0006	.0029	.0029	-.0000	.0001	.0001
.0017	-.0023	.0096	-.0000	-.0001	.0002
.0041	-.0037	.0133	.0001	-.0001	.0003
.0065	-.0044	.0161	.0002	-.0001	.0004
.0089	-.0049	.0186	.0002	-.0001	.0005
.0299	-.0042	.0356	.0008	-.0001	.0009
.0509	-.0000	.0495	.0013	-.0000	.0013
.0720	.0050	.0625	.0018	.0001	.0016
.0930	.0102	.0747	.0024	.0003	.0019
.1140	.0156	.0863	.0029	.0004	.0022
.2581	.0518	.1531	.0066	.0013	.0039
.4022	.0835	.2032	.0102	.0021	.0052
.5463	.1084	.2399	.0139	.0028	.0061
.6904	.1271	.2641	.0175	.0032	.0067
.8345	.1391	.2763	.0212	.0035	.0070
.9787	.1450	.2767	.0249	.0037	.0070
1.1228	.1446	.2652	.0285	.0037	.0067
1.2669	.1377	.2419	.0322	.0035	.0061
1.4110	.1224	.2077	.0358	.0031	.0053
1.5551	.0979	.1632	.0395	.0025	.0041
1.6992	.0634	.1078	.0432	.0016	.0027
1.8023	.0318	.0617	.0458	.0008	.0016
1.8233	.0246	.0516	.0463	.0006	.0013
1.8443	.0173	.0413	.0468	.0004	.0010
1.8653	.0097	.0306	.0474	.0002	.0008
1.8864	.0018	.0197	.0479	.0000	.0005
1.9012	-.0038	.0118	.0483	-.0001	.0003
1.9036	-.0040	.0106	.0484	-.0001	.0003
1.9059	-.0034	.0093	.0484	-.0001	.0002
1.9083	-.0015	.0074	.0485	-.0000	.0002
1.9099	-.0029	.0029	.0485	.0001	.0001

English Units	SI Units
RADIUS (INCHES) = 10.860	RADIUS (METERS) = .2758
CHORD (INCHES) = 1.909	CHORD (METERS) = .0485
ZCSL (INCHES) = .8592	ZCSL (METERS) = .0218
YCSL (INCHES) = .1631	YCSL (METERS) = .0041
RLE (INCHES) = .0070	RLE (METERS) = .000178
RTE (INCHES) = .0070	RTE (METERS) = .000178
X-AREA (SQ. IN.) = .1841	X-AREA(SG.METERS)= .000119
GAMMA-CHORD(DEG.)= 16.78	GAMMA-CHORD(RAD.)= .2928

English Units (Inches) ZC	YP	YS	SI Units (Meters) ZC	YP	YS
-.0006	.0029	.0029	-.0000	.0001	.0001
-.0017	-.0023	.0096	-.0000	-.0001	.0002
-.0041	-.0037	.0133	-.0001	-.0001	.0003
-.0065	-.0044	.0162	-.0002	-.0001	.0004
-.0089	-.0049	.0187	-.0002	-.0001	.0005
.0298	-.0043	.0358	.0008	-.0001	.0009
.0508	-.0002	.0498	.0013	-.0000	.0013
.0717	.0048	.0628	.0018	.0001	.0016
.0926	.0100	.0751	.0024	.0003	.0019
.1136	.0153	.0867	.0029	.0004	.0022
.2572	.0513	.1536	.0065	.0013	.0039
.4008	.0829	.2038	.0102	.0021	.0052
.5444	.1077	.2405	.0138	.0027	.0061
.6880	.1263	.2647	.0175	.0032	.0067
.8317	.1383	.2769	.0211	.0035	.0070
.9753	.1442	.2772	.0248	.0037	.0070
1.1189	.1439	.2657	.0284	.0037	.0067
1.2625	.1371	.2423	.0321	.0035	.0062
1.4061	.1220	.2081	.0357	.0031	.0053
1.5497	.0976	.1634	.0394	.0025	.0042
1.6934	.0632	.1079	.0430	.0016	.0027
1.7961	.0317	.0618	.0456	.0008	.0016
1.8170	.0246	.0517	.0462	.0006	.0013
1.8380	.0172	.0413	.0467	.0004	.0010
1.8589	.0096	.0306	.0472	.0002	.0008
1.8798	.0018	.0197	.0481	-.0000	.0005
1.8946	-.0038	.0118	.0482	-.0001	.0003
1.8970	-.0040	.0106	.0482	-.0001	.0003
1.8994	-.0034	.0093	.0483	-.0000	.0002
1.9017	-.0015	.0074	.0483	-.0000	.0002
1.9033	-.0029	.0029	.0483	-.0001	.0001

English Units	SI Units
RADIUS (INCHES) = 11.559	RADIUS (METERS) = .2536
CHORD (INCHES) = 1.903	CHORD (METERS) = .0483
ZCSL (INCHES) = .8560	ZCSL (METERS) = .0217
YCSL (INCHES) = .1631	YCSL (METERS) = .0041
RLE (INCHES) = .0070	RLE (METERS) = .000178
RTE (INCHES) = .0070	RTE (METERS) = .000178
X-AREA (SQ. IN.) = .1853	X-AREA(SG.METERS)= .000120
GAMMA-CHORD(DEG.)= 16.48	GAMMA-CHORD(RAD.)= .2876

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

First set

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0007	-.0030	.0030	-.0000	.0001	.0001
.0017	-.0023	.0097	.0000	-.0001	.0002
.0041	-.0037	.0134	.0001	-.0001	.0003
.0065	-.0044	.0163	.0002	-.0001	.0004
.0088	-.0049	.0188	.0002	-.0001	.0005
.0297	-.0043	.0361	.0008	-.0001	.0009
.0506	-.0002	.0502	.0013	-.0000	.0013
.0714	.0047	.0653	.0018	.0001	.0016
.0923	.0099	.0756	.0023	.0003	.0019
.1132	.0152	.0873	.0029	.0004	.0022
.2563	.0512	.1546	.0065	.0013	.0039
.3995	.0828	.2050	.0101	.0021	.0052
.5426	.077	.2420	.0138	.0027	.0061
.6858	.1263	.2662	.0174	.0032	.0068
.8289	.1384	.2785	.0211	.0035	.0071
.9720	.444	.2787	.0247	.0037	.0071
1.1152	.1442	.2671	.0283	.0037	.0068
1.2583	.1374	.2436	.0320	.0035	.0062
1.4015	.1223	.2092	.0356	.0031	.0053
1.5446	.0978	.1643	.0392	.0025	.0042
1.6877	.0634	.1085	.0429	.0016	.0028
1.7901	.0318	.0622	.0455	.0008	.0016
1.8110	.0247	.0520	.0460	.0006	.0013
1.8319	.0173	.0415	.0465	.0004	.0011
1.8528	.0097	.0308	.0471	.0002	.0008
1.8736	.0018	.0198	.0476	.0000	.0005
1.8883	-.0038	.0119	.0480	-.0001	.0003
1.8907	-.0040	.0106	.0480	-.0001	.0003
1.8931	-.0033	.0093	.0481	-.0001	.0002
1.8955	-.0015	.0074	.0481	-.0000	.0002
1.8971	-.0030	.0030	.0482	.0000	.0001

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) = 12.257		RADIUS (METERS) = .3113	
CHORD (INCHES) = 1.896		CHORD (METERS) = .0482	
ZCSL (INCHES) = .8530		ZCSL (METERS) = .0217	
YCSL (INCHES) = .1638		YCSL (METERS) = .0042	
RLE (INCHES) = .0070		RLE (METERS) = .000178	
RTE (INCHES) = .0070		RTE (METERS) = .000178	
X-AREA (SQ. IN.) = .1865		X-AREA(SQ.METERS)= .000120	
GAMMA-CHORD(DEG.)= 16.43		GAMMA-CHORD(RAD.)= .2867	

Second set

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
.0007	-.0030	.0030	-.0000	.0001	.0001
.0017	-.0023	.0097	.0000	-.0001	.0002
.0041	-.0036	.0135	.0001	-.0001	.0003
.0064	-.0044	.0164	.0002	-.0001	.0004
.0088	-.0049	.0189	.0002	-.0001	.0005
.0296	-.0044	.0363	.0008	-.0001	.0009
.0504	-.0004	.0504	.0013	-.0000	.0013
.0712	.0045	.0636	.0018	.0001	.0016
.0920	.0097	.0760	.0023	.0002	.0019
.1129	.0149	.0877	.0029	.0004	.0022
.2556	.0507	.1551	.0065	.0013	.0039
.3983	.0821	.2056	.0101	.0021	.0052
.5410	.1069	.2426	.0137	.0027	.0062
.6837	.1255	.2668	.0174	.0032	.0068
.8265	.1376	.2790	.0210	.0035	.0071
.9692	.1436	.2793	.0246	.0036	.0071
1.1119	.1434	.2676	.0282	.0036	.0068
1.2546	.1367	.2440	.0319	.0035	.0062
1.3973	.1218	.2095	.0355	.0031	.0053
1.5401	.0975	.1645	.0391	.0025	.0042
1.6828	.0632	.1087	.0427	.0016	.0028
1.7849	.0317	.0622	.0453	.0008	.0016
1.8057	.0246	.0520	.0459	.0006	.0013
1.8265	.0172	.0416	.0464	.0004	.0011
1.8473	.0096	.0308	.0469	.0002	.0008
1.8681	.0018	.0198	.0474	.0000	.0005
1.8828	-.0038	.0119	.0478	-.0001	.0003
1.8851	-.0040	.0106	.0479	-.0001	.0003
1.8875	-.0033	.0093	.0479	-.0001	.0002
1.8899	-.0015	.0074	.0480	-.0000	.0002
1.8915	-.0030	.0030	.0480	.0001	.0001

English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) = 12.956		RADIUS (METERS) = .3291	
CHORD (INCHES) = 1.891		CHORD (METERS) = .0480	
ZCSL (INCHES) = .8502		ZCSL (METERS) = .0216	
YCSL (INCHES) = .1637		YCSL (METERS) = .0042	
RLE (INCHES) = .0072		RLE (METERS) = .000183	
RTE (INCHES) = .0070		RTE (METERS) = .000178	
X-AREA (SQ. IN.) = .1878		X-AREA(SQ.METERS)= .000121	
GAMMA-CHORD(DEG.)= 16.25		GAMMA-CHORD(RAD.)= .2836	

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

(First Section)

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0007	-.0030	.0030	-.0000	.0001	.0001
.0017	-.0023	.0097	.0000	-.0001	.0002
.0040	-.0036	.0135	.0001	-.0001	.0003
.0064	-.0049	.0165	.0002	-.0001	.0004
.0088	-.0045	.0190	.0002	-.0001	.0005
.0295	-.0045	.0365	.0008	-.0001	.0009
.0503	-.0005	.0507	.0013	-.0000	.0013
.0710	.0043	.0639	.0018	.0001	.0016
.0918	.0094	.0764	.0023	.0002	.0019
.1126	.0147	.0881	.0029	.0004	.0022
.2549	.0503	.1558	.0065	.0013	.0040
.3972	.0816	.2064	.0101	.0021	.0052
.5396	.1064	.2434	.0137	.0027	.0062
.6819	.1249	.2677	.0173	.0032	.0068
.8243	.1370	.2800	.0209	.0035	.0071
.9666	.1430	.2801	.0246	.0036	.0071
1.1090	.1429	.2684	.0282	.0036	.0068
1.2513	.1364	.2447	.0318	.0035	.0062
1.3936	.1215	.2101	.0354	.0031	.0053
1.5360	.0973	.1650	.0390	.0025	.0042
1.6783	.0631	.1089	.0426	.0016	.0028
1.7801	.0317	.0624	.0452	.0008	.0016
1.8009	.0245	.0522	.0457	.0006	.0013
1.8217	.0172	.0417	.0463	.0004	.0011
1.8424	.0096	.0309	.0468	.0002	.0008
1.8632	.0018	.0198	.0473	.0000	.0005
1.8778	-.0038	.0119	.0477	-.0001	.0003
1.8801	-.0040	.0106	.0478	-.0001	.0003
1.8825	-.0033	.0093	.0478	-.0001	.0002
1.8849	-.0015	.0074	.0479	-.0000	.0002
1.8865	.0030	.0030	.0479	.0001	.0001

English Units		SI Units	
RADIUS (INCHES) =	13.655	RADIUS (METERS) =	.3468
CHORD (INCHES) =	1.886	CHORD (METERS) =	.0479
ZCSL (INCHES) =	.8478	ZCSL (METERS) =	.0215
YCSL (INCHES) =	.1639	YCSL (METERS) =	.0042
RLE (INCHES) =	.0074	RLE (METERS) =	.000188
RTE (INCHES) =	.0070	RTE (METERS) =	.000178
X-AREA (SQ. IN.) =	.1892	X-AREA(SQ.METERS)=	.000122
GAMMA-CHORD(DEG.)=	16.05	GAMMA-CHORD(RAD.)=	.2802

(Second Section)

English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS
-.0007	-.0030	.0030	-.0000	.0001	.0001
.0017	-.0022	.0098	.0000	-.0001	.0002
.0040	-.0036	.0136	.0001	-.0001	.0003
.0064	-.0043	.0166	.0002	-.0001	.0004
.0087	-.0049	.0192	.0002	-.0001	.0005
.0294	-.0045	.0368	.0007	-.0001	.0009
.0502	-.0006	.0511	.0013	-.0000	.0013
.0709	.0043	.0645	.0018	.0001	.0016
.0916	.0094	.0770	.0023	.0002	.0020
.1123	.0146	.0889	.0029	.0004	.0023
.2543	.0503	.1570	.0065	.0013	.0040
.3963	.0817	.2079	.0101	.0021	.0053
.5384	.1066	.2451	.0137	.0027	.0062
.6804	.1251	.2695	.0173	.0032	.0068
.8224	.1373	.2818	.0209	.0035	.0072
.9644	.1434	.2820	.0245	.0036	.0072
1.1064	.1434	.2701	.0281	.0036	.0069
1.2484	.1368	.2463	.0317	.0035	.0063
1.3905	.1220	.2114	.0353	.0031	.0054
1.5325	.0977	.1660	.0389	.0025	.0042
1.6745	.0634	.1096	.0425	.0016	.0028
1.7761	.0318	.0628	.0451	.0008	.0016
1.7968	.0247	.0525	.0456	.0006	.0013
1.8175	.0173	.0419	.0462	.0004	.0011
1.8382	.0097	.0311	.0467	.0002	.0008
1.8589	.0018	.0199	.0472	.0000	.0005
1.8735	-.0038	.0119	.0476	-.0001	.0003
1.8759	-.0040	.0106	.0476	-.0001	.0003
1.8782	-.0033	.0093	.0477	-.0001	.0002
1.8806	-.0014	.0074	.0478	-.0000	.0002
1.8822	.0030	.0030	.0478	.0001	.0001

English Units		SI Units	
RADIUS (INCHES) =	14.354	RADIUS (METERS) =	.3546
CHORD (INCHES) =	1.881	CHORD (METERS) =	.0478
ZCSL (INCHES) =	.8456	ZCSL (METERS) =	.0215
YCSL (INCHES) =	.1648	YCSL (METERS) =	.0042
RLE (INCHES) =	.0074	RLE (METERS) =	.000193
RTE (INCHES) =	.0070	RTE (METERS) =	.000178
X-AREA (SQ. IN.) =	.1907	X-AREA(SQ.METERS)=	.000123
GAMMA-CHORD(DEG.)=	15.90	GAMMA-CHORD(RAD.)=	.2775

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
-.0007	.0031	.0031	-.0000	.0001	.0001	-.0008	.0032	.0032	-.0000	.0001	.0001
-.0016	-.0022	.0099	-.0000	-.0001	.0003	-.0016	-.0020	.0102	-.0000	-.0000	.0003
-.0040	-.0035	.0138	.0001	-.0001	.0004	-.0039	-.0034	.0142	.0001	-.0001	.0004
-.0063	-.0042	.0169	.0002	-.0001	.0004	-.0063	-.0041	.0172	.0002	-.0001	.0004
-.0087	-.0048	.0195	.0002	-.0001	.0005	-.0086	-.0046	.0199	.0002	-.0001	.0005
.0294	-.0043	.0374	.0007	-.0001	.0010	.0293	-.0038	.0384	.0007	-.0001	.0010
.0500	-.0002	.0521	.0013	-.0000	.0013	.0499	-.0006	.0536	.0013	-.0000	.0014
.0707	.0048	.0657	.0018	.0001	.0017	.0706	.0060	.0677	.0018	.0002	.0017
.0914	.0100	.0785	.0023	.0003	.0020	.0912	.0117	.0809	.0023	.0003	.0021
.1120	.0154	.0906	.0028	.0004	.0023	.1119	.0174	.0935	.0028	.0004	.0024
.2538	.0520	.1601	.0064	.0013	.0041	.2535	.0562	.1653	.0064	.0014	.0042
.3955	.0842	.2119	.0100	.0021	.0054	.3951	.0902	.2189	.0100	.0023	.0056
.5373	.1096	.2498	.0136	.0028	.0063	.5367	.1169	.2580	.0136	.0030	.0066
.6790	.1236	.2746	.0172	.0033	.0070	.6783	.1367	.2836	.0172	.0035	.0072
.8207	.1410	.2871	.0208	.0036	.0073	.8199	.1496	.2966	.0208	.0038	.0075
.9625	.1472	.2873	.0244	.0037	.0073	.9615	.1560	.2968	.0244	.0040	.0075
1.1042	.1472	.2753	.0280	.0037	.0070	1.1031	.1558	.2846	.0280	.0040	.0072
1.2459	.1404	.2510	.0316	.0036	.0064	1.2447	.1485	.2597	.0316	.0038	.0066
1.3877	.1252	.2156	.0352	.0032	.0055	1.3863	.1322	.2233	.0352	.0034	.0057
1.5294	.1003	.1694	.0388	.0025	.0043	1.5279	.1060	.1756	.0388	.0027	.0045
1.6712	.0652	.1119	.0424	.0017	.0028	1.6695	.0689	.1161	.0424	.0018	.0029
1.7725	.0328	.0640	.0450	.0008	.0016	1.7708	.0348	.0664	.0450	.0009	.0017
1.7932	.0254	.0535	.0455	.0006	.0014	1.7914	.0271	.0555	.0455	.0007	.0014
1.8139	.0179	.0427	.0461	.0005	.0011	1.8121	.0191	.0442	.0460	.0005	.0011
1.8345	.0101	.0316	.0466	.0003	.0008	1.8327	.0109	.0327	.0466	.0003	.0008
1.8552	.0020	.0202	.0471	.0001	.0005	1.8534	.0024	.0208	.0471	.0001	.0005
1.8698	-.0037	.0120	.0475	-.0001	.0003	1.8679	-.0036	.0123	.0474	-.0001	.0003
1.8721	-.0039	.0107	.0476	-.0001	.0003	1.8703	-.0038	.0109	.0475	-.0001	.0003
1.8745	-.0032	.0094	.0476	-.0001	.0002	1.8726	-.0031	.0095	.0476	-.0001	.0002
1.8768	-.0014	.0075	.0477	-.0000	.0002	1.8750	-.0012	.0076	.0476	-.0000	.0002
1.8784	.0031	.0031	.0477	.0001	.0001	1.8766	.0032	.0032	.0477	.0001	.0001

English Units (Inches)	SI Units (Meters)	English Units (Inches)	SI Units (Meters)
RADIUS (INCHES) = 15.052	RADIUS (METERS) = .3823	RADIUS (INCHES) = 15.402	RADIUS (METERS) = .3512
CHORD (INCHES) = 1.878	CHORD (METERS) = .0477	CHORD (INCHES) = 1.876	CHORD (METERS) = .0476
ZCSL (INCHES) = .8436	ZCSL (METERS) = .0214	ZCSL (INCHES) = .8424	ZCSL (METERS) = .0214
YCSL (INCHES) = .1684	YCSL (METERS) = .0043	YCSL (INCHES) = .1755	YCSL (METERS) = .0045
RLE (INCHES) = .0070	RLE (METERS) = .000198	RLE (INCHES) = .0070	RLE (METERS) = .000198
RTE (INCHES) = .0070	RTE (METERS) = .000178	RTE (INCHES) = .0070	RTE (METERS) = .000178
X-AREA (SQ. IN.) = .1925	X-AREA(SQ.METERS)= .000124	X-AREA (SQ. IN.) = .1936	X-AREA(SQ.METERS)= .000125
GAMMA-CHORD(DEG.)= 16.01	GAMMA-CHORD(RAD.)= .2793	GAMMA-CHORD(DEG.)= 16.40	GAMMA-CHORD(RAD.)= .2862

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
-.0009	.0034	.0034	-.0000	.0001	.0001	-.0010	.0036	.0036	-.0000	.0001	.0001
-.0014	-.0018	.0107	.0000	-.0000	.0003	-.0014	-.0016	.0110	.0000	-.0000	.0003
-.0038	-.0032	.0148	.0001	-.0001	.0004	-.0037	-.0030	.0152	.0001	-.0001	.0004
-.0061	-.0037	.0181	.0002	-.0001	.0005	-.0060	-.0035	.0186	.0002	-.0001	.0005
-.0085	-.0041	.0209	.0002	-.0001	.0005	-.0084	-.0039	.0215	.0002	-.0001	.0005
.0291	-.0026	.0406	.0007	-.0001	.0010	.0290	-.0019	.0419	.0007	-.0000	.0011
.0497	-.0027	.0569	.0013	-.0001	.0014	.0496	-.0038	.0589	.0013	-.0001	.0015
.0703	-.0089	.0720	.0018	-.0002	.0018	.0702	-.0106	.0746	.0018	-.0003	.0019
.0910	-.0154	.0862	.0023	-.0004	.0022	.0908	-.0175	.0894	.0023	-.0004	.0023
.1116	-.0219	.0997	.0028	-.0006	.0025	.1115	-.0245	.1033	.0028	-.0006	.0026
.2530	.0657	.1767	.0064	.0017	.0045	.2528	.0712	.1833	.0064	.0018	.0047
.3945	.1035	.2339	.0100	.0026	.0059	.3942	.1111	.2426	.0100	.0028	.0062
.5359	.1330	.2756	.0136	.0034	.0070	.5355	.1422	.2858	.0136	.0036	.0073
.6773	.1547	.3030	.0172	.0039	.0077	.6769	.1651	.3141	.0172	.0042	.0080
.8188	.1687	.3168	.0208	.0043	.0080	.8182	.1797	.3284	.0208	.0046	.0083
.9602	.1754	.3173	.0244	.0045	.0081	.9596	.1866	.3290	.0244	.0047	.0084
1.1017	.1747	.3045	.0280	.0044	.0077	1.1009	.1856	.3160	.0280	.0047	.0080
1.2431	.1662	.2784	.0316	.0042	.0071	1.2422	.1763	.2891	.0316	.0045	.0073
1.3845	.1478	.2398	.0352	.0038	.0061	1.3836	.1568	.2494	.0351	.0040	.0063
1.5260	.1185	.1890	.0388	.0030	.0048	1.5249	.1258	.1969	.0387	.0032	.0050
1.6674	.0773	.1253	.0424	.0020	.0032	1.6663	.0821	.1306	.0423	.0021	.0033
1.7686	.0394	.0716	.0449	.0010	.0018	1.7674	.0421	.0747	.0449	.0011	.0019
1.7892	.0308	.0598	.0454	.0008	.0015	1.7880	.0330	.0623	.0454	.0008	.0016
1.8098	.0219	.0476	.0460	.0006	.0012	1.8086	.0236	.0495	.0459	.0006	.0013
1.8304	.0128	.0350	.0465	.0003	.0009	1.8292	.0139	.0364	.0465	.0004	.0009
1.8511	.0033	.0221	.0470	.0001	.0006	1.8498	.0038	.0229	.0470	.0001	.0006
1.8656	-.0034	.0128	.0474	-.0001	.0003	1.8644	-.0032	.0131	.0474	-.0001	.0003
1.8679	-.0035	.0113	.0474	-.0001	.0003	1.8667	-.0034	.0115	.0474	-.0001	.0003
1.8703	-.0028	.0098	.0475	-.0001	.0002	1.8690	-.0027	.0100	.0475	-.0001	.0003
1.8726	-.0010	.0079	.0476	-.0000	.0002	1.8714	-.0009	.0080	.0475	-.0000	.0002
1.8742	-.0034	.0034	.0476	-.0001	.0001	1.8730	.0036	.0036	.0476	-.0001	.0001

RADIUS (INCHES) = 15.891	RADIUS (METERS) = .4036	RADIUS (INCHES) = 16.170	RADIUS (METERS) = .4107
CHORD (INCHES) = 1.873	CHORD (METERS) = .0476	CHORD (INCHES) = 1.872	CHORD (METERS) = .0475
ZCSL (INCHES) = .8406	ZCSL (METERS) = .0214	ZCSL (INCHES) = .8397	ZCSL (METERS) = .0213
YCSL (INCHES) = .1910	YCSL (METERS) = .0049	YCSL (INCHES) = .2000	YCSL (METERS) = .0051
RLE (INCHES) = .0080	RLE (METERS) = .000203	RLE (INCHES) = .0084	RLE (METERS) = .000206
RTE (INCHES) = .0070	RTE (METERS) = .000178	RTE (INCHES) = .0070	RTE (METERS) = .000178
X-AREA (SQ. IN.) = .1956	X-AREA(SQ.METERS) = .000126	X-AREA (SQ. IN.) = .1968	X-AREA(SQ.METERS) = .000127
GAMMA-CHORD(DEG.) = 17.37	GAMMA-CHORD(RAD.) = .3032	GAMMA-CHORD(DEG.) = 17.94	GAMMA-CHORD(RAD.) = .3131

TABLE XXVII (Cont'd)

AIRFOIL COORDINATES ON MANUFACTURING SURFACES – STATOR 2

English Units (Inches)			SI Units (Meters)			English Units (Inches)			SI Units (Meters)		
ZC	YP	YS	ZC	YP	YS	ZC	YP	YS	ZC	YP	YS
-.0011	.0037	.0037	-.0000	.0001	.0001	-.0012	.0039	.0039	-.0000	.0001	.0001
-.0013	-.0015	.0113	-.0000	-.0000	.0003	-.0011	-.0013	.0119	-.0000	-.0000	.0003
-.0036	-.0029	.0157	-.0001	-.0001	.0004	-.0035	-.0027	.0164	-.0001	-.0001	.0004
-.0059	-.0034	.0191	-.0002	-.0001	.0005	-.0058	-.0031	.0200	-.0001	-.0001	.0005
-.0083	-.0036	.0222	-.0002	-.0001	.0006	-.0081	-.0032	.0232	-.0002	-.0001	.0006
-.0289	-.0012	.0434	-.0007	-.0000	.0011	-.0287	-.0000	.0457	-.0007	-.0000	.0012
-.0495	.0051	.0610	-.0013	.0001	.0015	-.0493	.0071	.0645	-.0013	.0002	.0016
-.0701	.0124	.0774	-.0018	.0003	.0020	-.0699	.0152	.0819	-.0018	.0004	.0021
-.0907	.0198	.0928	-.0023	.0005	.0024	-.0905	.0236	.0983	-.0023	.0006	.0025
-.1113	.0274	.1073	-.0028	.0007	.0027	-.1110	.0320	.1137	-.0028	.0008	.0029
-.2526	.0771	.1904	-.0064	.0020	.0048	-.2522	.0866	.2018	-.0064	.0022	.0051
-.3938	.1194	.2520	-.0100	.0030	.0064	-.3933	.1326	.2669	-.0100	.0034	.0068
-.5351	.1523	.2967	-.0136	.0039	.0075	-.5344	.1681	.3139	-.0136	.0043	.0080
-.6764	.1763	.3260	-.0172	.0045	.0083	-.6756	.1939	.3448	-.0172	.0049	.0088
-.8176	.1915	.3409	-.0208	.0049	.0087	-.8167	.2101	.3605	-.0207	.0053	.0092
-.9589	.1986	.3416	-.0244	.0050	.0087	-.9578	.2174	.3614	-.0243	.0055	.0092
1.0001	.1973	.3283	-.0279	.0050	.0083	1.0989	.2158	.3476	-.0279	.0055	.0088
1.2414	.1873	.3007	-.0315	.0048	.0076	1.2401	.2046	.3189	-.0315	.0052	.0081
1.3827	.1666	.2597	-.0351	.0042	.0066	1.3812	.1819	.2759	-.0351	.0046	.0070
1.5239	.1336	.2053	-.0387	.0034	.0052	1.5223	.1461	.2187	-.0387	.0037	.0056
1.6652	.0875	.1364	-.0423	.0022	.0035	1.6635	.0959	.1457	-.0423	.0024	.0037
1.7662	.0450	.0779	-.0449	.0011	.0020	1.7644	.0496	.0833	-.0448	.0013	.0021
1.7868	.0354	.0650	-.0454	.0009	.0017	1.7850	.0391	.0694	-.0453	.0010	.0018
1.8074	.0254	.0516	-.0459	.0006	.0013	1.8056	.0282	.0551	-.0459	.0007	.0014
1.8280	.0151	.0378	-.0464	.0004	.0010	1.8261	.0169	.0403	-.0464	.0004	.0010
1.8486	.0044	.0237	-.0470	.0001	.0006	1.8467	.0053	.0250	-.0469	.0001	.0006
1.8631	-.0030	.0134	-.0473	-.0001	.0003	1.8612	-.0028	.0140	-.0473	-.0001	.0004
1.8655	-.0032	.0117	-.0474	-.0001	.0003	1.8636	-.0030	.0122	-.0473	-.0001	.0003
1.8678	-.0026	.0101	-.0474	-.0001	.0003	1.8659	-.0023	.0104	-.0474	-.0001	.0003
1.8702	-.0007	.0081	-.0475	-.0000	.0002	1.8682	-.0005	.0083	-.0475	-.0000	.0002
1.8718	.0037	.0037	-.0475	.0001	.0001	1.8698	.0039	.0039	-.0475	.0001	.0001

English Units (Inches)		SI Units (Meters)		English Units (Inches)		SI Units (Meters)	
RADIUS (INCHES) =	16.450	RADIUS (METERS) =	.4178	RADIUS (INCHES) =	16.869	RADIUS (METERS) =	.4285
CHORD (INCHES) =	1.871	CHORD (METERS) =	.0475	CHORD (INCHES) =	1.869	CHORD (METERS) =	.0475
ZCSL (INCHES) =	.8384	ZCSL (METERS) =	.0213	ZCSL (INCHES) =	.8370	ZCSL (METERS) =	.0213
YCSL (INCHES) =	.2695	YCSL (METERS) =	.0053	YCSL (INCHES) =	.2246	YCSL (METERS) =	.0057
RLE (INCHES) =	.0031	RLE (METERS) =	.000206	RLE (INCHES) =	.0061	RLE (METERS) =	.000213
RTE (INCHES) =	.0070	RTE (METERS) =	.000178	RTE (INCHES) =	.0070	RTE (METERS) =	.000178
X-AREA (SQ. IN.) =	.1980	X-AREA(SQ.METERS)=	.000128	X-AREA (SQ. IN.) =	.2000	X-AREA(SQ.METERS)=	.000125
GAMMA-CHORD(DEG.)=	18.14	GAMMA-CHORD(RAD.)=	.3167	GAMMA-CHORD(DEG.)=	18.13	GAMMA-CHORD(RAD.)=	.3164

APPENDIX E

TWO-RING ACOUSTIC INLET AERODYNAMIC AND ACOUSTIC DESIGN

An acoustic inlet design was studied in addition to the translating center-body finally chosen. A schematic of this additional design, a two-ring configuration, is shown in Figure 71. Mach number distributions are included on the O.D. wall and splitter surfaces. Although the inlet flow is not choked, the blockage of the rings was estimated to be about 3 percent of the area. Boundary layer shape factors on all surfaces were well below the separation criterion of 2.2 to 2.5.

For acoustic purposes, the rings, the extended centerbody, and the inner and outer walls were all treated with various combinations of honeycomb and facing sheet. These acoustic treatment parameters are listed in Table XXVIII. An effective-treatment-length to passage-height of about six was achieved for the two outer passages and about four for the inner passage. Treatment was tuned to the predicted inlet fan noise spectrum to maximize the PNL reduction at approach. The inlet attenuation target and predicted treatment attenuation are shown in Figure 72. The attenuation target represents a PNL reduction of 15 PNdB at the peak inlet noise angle.

TABLE XXVIII

TWO-RING ACOUSTIC INLET TREATMENT PARAMETERS

	TREATMENT LENGTH METERS (INCHES)	BACKING DEPTH METERS (INCHES)	FACING SHEET % OPEN AREA	HONEYCOMB CELL SIZE METERS (INCHES)
Outer Wall	0.61 (24)	0.013 (0.5)	12	0.0095 (3/8)
Outer Ring	0.43 (17)	0.006/0.006 (0.25/0.25)	12/9	0.0095 (3/8)
Inner Ring	0.38 (15)	0.006/0.006 (0.25/0.25)	9/6	0.0095 (3/8)
Centerbody	0.30 (12)	0.013 (0.5)	6	0.0095 (3/8)
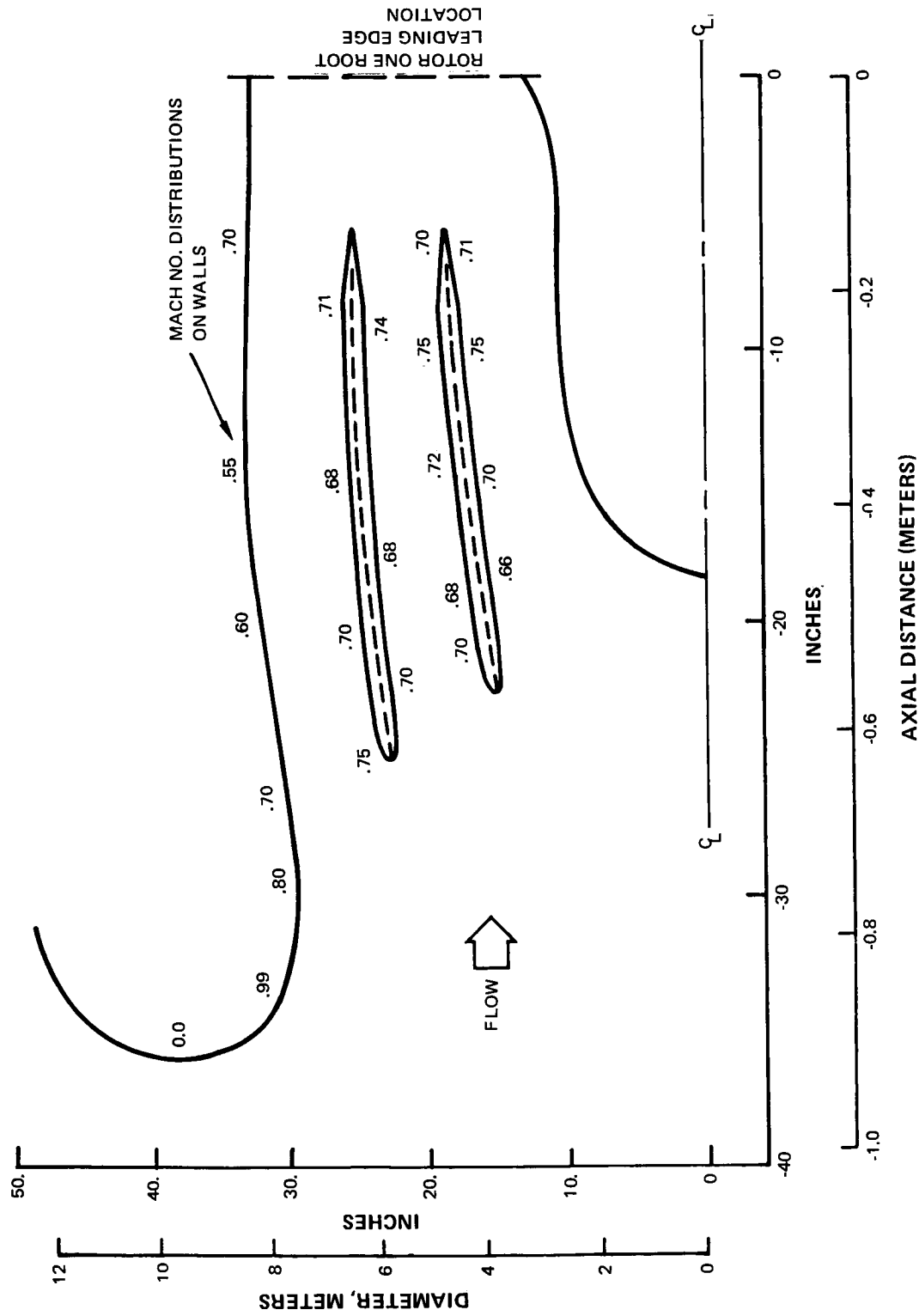
Figure 71   Two-Ring Acoustic Inlet Design Schematic
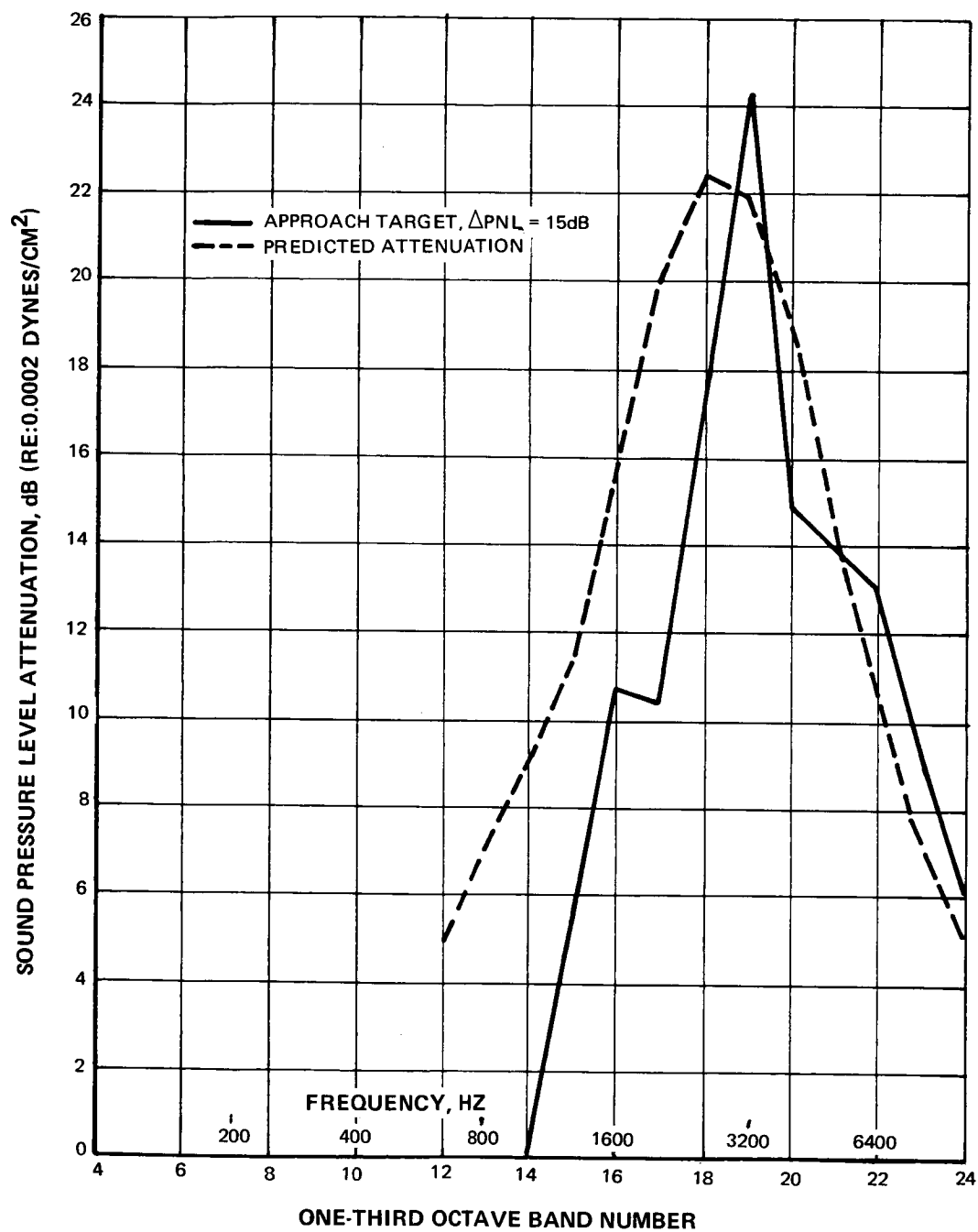
Figure 72   Two-Ring Acoustic Inlet Predicted Attenuation

REFERENCES

1. Brines, G. L.: "Studies for Determining the Optimum Propulsion System Characteristics for Use in a Long Range Transport Aircraft," NASA CR-120950, PWA-4449, July 1972

2. Keenan, M. J. and Burdsall, E. A.: "High-Loading Low-Speed Fan Study – V Final Report," NASA CR-121148, PWA-4517, April 1973

3. Ruggeri, R. S. and Benser, W. A.: "Performance of a Highly Loaded Two-Stage Axial Flow Fan," NASA Technical Note (to be published)

4. Messenger, H. E. and Kennedy, E. E.: "Two-Stage Fan – I Aerodynamic and Mechanical Design," NASA CR-120859, PWA-4148, January 1972

5. Harley, K. G.; Odegard, P.A.; and Burdsall, E. A.: "High-Loading Low-Speed Fan Study – IV Data and Performance with Redesign Stator and Including a Rotor Tip Casing Treatment," NASA CR-120866, PWA-4326, July 1972

6. Monsarrat, N. T., Keenan, M. J.; and Tramm, P. C.: "High-Loading Low-Speed Fan Study – I Design," NASA CR-72536, PWA-3535, July 1969

7. Keenan, M. H. and Bartok, J. A: "Experimental Evaluation of Transonic Stators – Final Report," NASA CR-72298, PWA-3470, 1969

8. Tyler, J. M. and Sofrin, T.G.: "Axial Flow Compressor Noise Studies," SAE Trans. Vol. 70, pp. 309 - 322, 1962

9. Rice, E. J.: "Performance of Suppressors for a Full Scale Fan for Turbofan Engines," NASA TMX-52941, 1971

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